

JOURNAL

OF THE

Agricultural and Horticultural Society

OF

INDIA.

VOL. VI.

PART I.—JANUARY 1878 TO DECEMBER 1881.

ORIGINAL COMMUNICATIONS.

"A body of men engaged in the same pursuit, with a joint stock of their information and experience, and therby put every individual in possession of the sum total acquired by them all."—REV. DR. WILLIAM CAREY.



Calendar.

T. BLACK & CO., PRINTERS, 55, BENTINCK STREET.

MDCCLXXXII.

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OF

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DECEMBER 31st, 1881.

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A.—(Continued)

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B.

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B.—(Continued.)

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I.

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	Juggut Jung Bahadoor, Rana, Nepaul	1878

K.

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255	Kerswill, T. H., Esq., Mundakatta Tea Estate, Gow- hatty	1881
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	Kincaid, Lieut.-Col. W., Pol. Agent, Bhopal, Sehore...	1867

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265 Koek, Edwin, Esq., Advocate, Supreme Court, Singapore	1880
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L

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270 Larmini, W. R., Esq., Civil Service, Burdwah	1862
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275 Lennox, H. M., Esq., Hyah, Nowgong, Assam	1880
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M.

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M.—(Continued.)

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290	Mackenzie, W. S., Esq., Jutwanpore	Somastipore,	1879
	• Tirhoot
	Mackenzie, W. Esq., Itmasnugger,	Somastipore,	1880
	Tirhoot
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	Mackinnon, D., Esq., Merchant,	Calcutta	1874
	Mackinnon, John, Esq., Merchant,	Calcutta	1875
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	Macpherson, W., Esq., Civil Service,	Nuddea	1861
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	Maharajah of Cooch Behar	...	1864
	Maharajah (Coomar) of Vizianagram	...	1879
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	Manager, Arcuttipore Tea Co.,	Cachar	1879
	Manager, Awah Estate, Awahgurh,	Agra District	1879
	Manager, Balasun Tea Co.,	Darjeeling	1875
	Manager, Bengal Tea Company,	Cachar	1867
310	Manager, Bishnath Tea Co.,	Assam	1875
	Manager, Blackburne Tea Garden,	Assam	1881
	Manager, Boreilli Tea Company,	Assam	1873
	Manager, Brahmapootra Tea Co.,	Assam	1875
	Manager, Burramsal Garden,	Sylhet	1876
315	Manager, Boromcherra Tea Garden,	Cachar	1876
	Manager, Central Cachar Tea Co.	...	1875
	Manager, Central Terai Tea Co.,	Darjeeling	1875
	Manager, Chenga Tea Association,	Darjeeling	1875
	Manager, Chumta Tea Association,	Darjeeling	1875
320	Manager, Chunderpore Tea Garden,	Assam	1875
	Manager, Chundypore Tea Company,	Cachar	1862
	Manager, Cutlee Cherra Garden,	Cachar	1865
	Manager, Dahingapore Factory,	Assam	1865
	Manager, Darjeeling Tea and Cinchona Association,	...	1879
	Darjeeling
325	Manager, Debrooghur Divn. Upper Assam Tea Co.,	Assam	1881-
	Manager, Dooars Tea Company,	Julpigoree	1879

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		<i>Admitted.</i>
	Manager, Durrung Tea Company, Assam	... 1877
	Manager of Dewkonali Estate, Cuttack	... 1871
	Manager, East India Tea Company, Assam	... 1865
330	Manager, East India Tea Company, Cachar	... 1866
	Manager, Gellahutting Tea Estate, Assam	... 1877
	Manager, Giell Tea Co., Darjeeling ...	... 1875
	Manager, Goomrah Factory, Tirhoot ...	... 1865
	Manager, Government Garden, Fyzabad, Oudh	... 1871
335	Manager, Government Garden, Gondah, Oudh	... 1875
	Manager, Greenwood Tea Garden, Assam	... 1875
	Manager, Halmara Tea Estate, Assam ...	... 1870
	Manager, Hoolmari Tea Co., Assam ...	... 1875
	Manager, (General) Indian Glenrock Gold Mining Coy., Devalah ...	... 1881
340	Manager, Julnacherra Tea Garden, Cachar	... 1875
	Manager, Kaliabar Tea Estate, Assam ...	... 1876
	Manager, Kallacherra Tea Company, Cachar	... 1862
	Manager, Kalline Tea Garden, Cachar ...	... 1874
	Manager, Kamptee Gwallie Tea Estate, Debrooghrur	1875
345	Manager, Kanchunpore Tea Company, Cachar	... 1862
	Manager, Kassomaree Tea Garden, Assam	... 1875
	Manager, Kobira Tea Estate, Muugledye, Assam	... 1877
	Manager, Koeyah Factory, Cachar ...	... 1865
	Manager, Koomta Tea Garden, Assam ...	... 1869
350	Manager, Lalla Mookh Tea Garden, Cachar	... 1875
	Manager, Lallacherra Garden, Cachar ...	... 1879
	Manager, Luckimpore Tea Co., Assam ...	... 1875
	Manager, Luckwah Tea Garden, Assam	... 1875
	Manager, Majagram Tea Co., Cachar ...	... 1875
355	Manager, Majulighur Tea Estate, Assam	... 1875
	Manager, Meleng Tea Estate, Assam ...	... 1881
	Manager, Monacherra Tea Garden, Cachar	... 1875
	Manager, Moran Tea Co., Seesangor, Assam	... 1875
	Manager, Margaret Hope Tea Plantation, Darjeeling	1876
360	Manager, Massempore Tea Garden, Cachar	... 1875
	Manager, Mettegurrah Tea Concern, Darjeeling	... 1877
	Manager, Mesia Jan Tea Estate, Debrooghrur	... 1875
	Manager, Munguldye Tea Co., Assam ...	... 1875
	Manager, Muttuk Tea Co., Assam ...	... 1878
365	Manager, Narainpore Garden, Cachar ...	... 1865
	Manager, New Golaghat Assam Tea Co., Assam	... 1881
	Manager, Noakacharee Tea Company, Assam	... 1865
	Manager, Noobabree Tea Estate, Assam	... 1878
	Manager, Nuddea Ward's Estate, Kishnaghur	... 1875
370	Manager, Pattareah Tea Co., Sylhet 1875
	Manager, Phoenix Tea Co., Cachar 1878

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	Manager, Piakpara Estate, Piakpara, near Calcutta	1879
	Manager, Punkabaree Tea Co., Punkabaree	1878
	Manager, Rajmai Tea Estate, Assam ...	1881
375	Manager, Rampore Tea Garden, Cachar	1880
	Manager, Roopacherra Tea Garden, Cachar	1875
	Manager, Rungting Tea Co., Darjeeling	1881
	Manager, Scottish Assam Tea Co., Assam	1875
	Manager, Silcoorie Tea Garden, Cachar	1875
380	Manager, Singtoom Tea Garden, Darjeeling	1880
	Manager, Singbuli and Nurmah Tea Co., Ltd., Darjeeling ...	1875
	Manager, Singell Tea Company, Darjeeling	1874
	Manager, Sissobari Garden, Julpigoree	1877
	Manager, Sonai Tea Co., Cachar	1877
385	Manager, Springside Tea Garden, Kurseong	1875
	Manager, Tarrapore Tea Co., Burtoll Div., Cachar...	1880
	Manager, Tarrapore Tea Co., Lallong Div., Cachar...	1865
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	Manager, Teendarea Tea Company, Darjeeling ...	1874
390	Manager, Teesta Valley Tea Association, Darjeeling	1875
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500	Secretary, Cantonment Fund Committee, Morar	1878
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505	Secretary, Municipal Committee, Mirzapore	1869
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	Secretary, Public Garden, Azimghur	1871
510	Secretary, Public Garden, Benares	1875
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535	Stalkartt, J., Esq., Hope Town, Darjeeling	1863
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	Sumbhoo Narayana, Rajah Bahadoor, Benares	...	•1872
	Superintendent, Chumba Estate, Chumba <i>vid</i> Dal-housie	...	1881
	Superintendent, Rambagh, Umritsur	...	1859
	Superintendent, Taj Garden, Agra	...	1874
555	Superintendent, Central Prison, Benares	...	1871
	Superintendent of Jorehat Tea Company, Assam	...	1885
	Superintendent, Serajgunge Jute Company, Seraj-gunge	...	1868
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māndoo, Nepal	1881

V.

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ghat, Assam	
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JOURNAL
OF THE
Agricultural and Horticultural Society
OF
INDIA.

The Gardener's Note Book, No. 25. Treatment of Anæctochili.
By J. J. COLES HARDINGE.

I SEE in the last published number of your Society's Journal (this year), a note by your Head Gardener about growing Anæctochilus, and his want of moss to grow them in. The climate of Calcutta and Rangoon is not very much different, so I think if he adopts my plan, he will be as successful in growing these beautiful plants as I have been.

I get shallow earthenware pans (about a foot in diameter) several drainage holes being made in them, these I fill with tolerably large pieces of clean broken brick and charcoal, sprinkling a handful or two of old rotten cocoanut husk powder, (*i. e.* the powder which falls from the husks when beaten), between the interstices of the broken brick. On this, I lay the pieces of Anæctochilus cut into lengths of one or two inches (or more if there are many) during the rains, when they soon root, and begin to grow, the roots firmly adhering to the pieces of bricks. In the rains, they are placed under a shed with an open trellis teak wood roof, over which some creepers have been trained, they require plenty of light, but should be shaded from the direct rays of the sun, these plants stand any amount of *drip*, which the generality of Orchids do not, and nothing is more fatal to many of them with large fleshy leaves, such as *Vandas*, and *Pholænopsis*.

Treatment of Anæctochili.

In dry weather, they are kept in the same situation watered daily, care must, however, be taken say in November, December, not to water them too freely or they rot off, the bricks and mould turning sour. Every year, just before the rains, I give them a fresh handful of coir dust, not "smothering" or covering the bulbs, they being left well exposed in December, January, the leaves begin to get discoloured and fall, and their season of rest is between that month and April when they should be sparingly watered. I use no moss at all for I have gathered these plants myself during the months of June and July, when it rains nearly every day, in the vallies about the hills on the Islands of Pulo Penang, Pulo Ramos, and others adjacent: their home is the deep crevices of damp boulders near running streams, or where there is a constant steamy moisture from evaporation. Where I found them in the greatest abundance, there was plenty of day light, but the rays of the sun could never reach them.

I may mention that last year Messrs. Hugh Low & Co.'s Orchid Collector, while passing through Rangoon, was quite struck with the size and hardiness of my plants, and he made a memo. of my method to take home with him for adoption in England.

RANGOON, 11th June, 1881.

A few remarks on wild Strawberries. By CAPTAIN J. F. POGSON.

I HAVE now the pleasure to acknowledge your letter of the 13th instant, received on the 17th, and in reply send a communication, connected with the identification of strawberries, (wild) and Potentillas; the publication of which, in due course, will perhaps be of value to persons whose cattle are suffering from cattle disease. (See Mr. Lennox's paper, Journal, Vol., VI. p. 149.)

I am sorry the rooted plants sent of our Potentilla, came

to grief. I fear the heat now is too intense for any plant to survive the journey between this and Calcutta, so will wait till the rains set in.

I enclose dried flowers, and leaves of alpine strawberry (leaf only) yellow flowered "Potentilla," and white flowered wood strawberry. This will, I trust, be of use till rooted plants can be sent with safety.

POTENTILLA.

The "*Potentilla denticulosa*" is common in the plains of Northern India, in the cold season, and at elevations of 4,000 to 5,000 feet in the Himalayas; two other species are found in the Neilgherries. (Royle, p. 202.)

POTENTILLA-TORMENTILLA. *Heptaphyllum sept.-foil*.—Root, "*Tomentilla radix*," very astringent, febrifuge, not stimulant. In the opinion of some, this is one of the best medicines of its class, as it produces astringent effects without causing excitement. Doctor A. T. Thomson recommends it in some kinds of diarrhoea. (See Supplement to the Pharmacopœia.)

"*Tomentilla rhizome*." The rhizome commonly called *Tomentilla root*, is large as compared with the size of the plant. Its external form is very irregular. Its colour externally is dark red-brown and internally, flesh red, or brownish. Its taste is astringent. It contains about 1·8 per cent. of Tannic acid. It is a useful remedy in chronic diarrhoea and dysentery, passive hemorrhages and intermittents. (See Elements of Materia Medica.)

The variety of *Potentilla* which grows at Kotegurh, (6,000 feet above the sea level) does not answer to any of these conditions. The root is thin and very slightly astringent. It has yellow flowers of five hearts-shaped petals. The fruit is dull red. Shaped like a very small strawberry, length about one third of an inch diameter, one quarter of an inch, fruit nearly all seed, taste a little astringent not the least acid or sweet. The leaves and stems somewhat astringent.

I think our plant is the "POTENTILLA ANSERINA" (Linn.) vel. "Fragaria anserina" which has a yellow flower and is a perennial.

FRAGARIA VESCA. "Alpine Strawberry."—"Wood Strawberry." Flowers white. Perennial. Woods and thickets. Roots aperient; fruit, *Strawberries* cooling, opening, diuretic; and diaphoretic. (See supplement to the Pharmacopœia.)

At Kotegurh, we have two distinct varieties of wild strawberry. The superior kind has large leaves, which are much larger than the leaves of the cultivated strawberry, and its fruit is deep red, size that of a filbert, taste that of an acid strawberry. This plant grows on Huttoo and Narkunda, good 500 to 800 feet above the Thibet and Hindooostan Road level. I have it growing in my garden; the plants were brought down from Huttoo. I think under suitable cultivation the fruit may be greatly improved both in size and flavour. The root of this strawberry, as well as the green or fresh leaves, are decidedly astringent.

I send dried leaves of all three plants and the dried flower one of each. Of the Potentilla, (yellow) and small or wood strawberry.

The inferior, or small wild strawberry, bears a perfectly round fruit, diameter one third of an inch, taste slightly acid with very little flavour. The fruit is quite edible.

The Hill men here call all three plants by the same name, "Bhoomla"; the color of the flower is used both before and after this word as "Sufaed Bhoomla" for the large kind "Bhoomla Zurd" for the Potentilla.

None of the plants indicated have been used here for cattle disease (foot and mouth) which has been very prevalent.

KOTEGURH, 19th May, 1881.

Note on the propagation of the Sugarcane from seed.

BY THE SECRETARY.

THE question of the propagation of the Sugarcane from seed has been again recently mooted. In an interesting paper by Mr. Walter Hill, Director of the Botanic Garden, Brisbane, Queensland, on Beet root *versus* Sugarcane, the subject is incidentally introduced. He writes:—"Numerous methods have been tried and many experiments made to induce the cane plant to perfect its seed, but hitherto they have proved unsuccessful. Attempts have also been made to get the flower of the Guinea corn and Indian corn to impregnate and fructify those of the Cane. The experiment succeeded as far as the growth of the plants, their flowering together, and the production of the seeds upon the arrow of the Indian corn was concerned, but no seed appeared, and subsequent microscopic examination showed that no change had been effected as regarded the formation of the seed."

It is now many years since this question was brought before the Agri-Horticultural Society of India. So long ago as in the year 1844, enquiry was made to it by the Royal Agricultural Society of Jamaica whether the Sugarcane was ever raised from seed, either in the East Indies or China. This enquiry elicited replies from residents in certain parts of India, but no satisfactory affirmative information was obtained, though it was shewn that the Cane when allowed to attain full maturity, seeded freely.

The idea that Sugarcane can be propagated from seed owed its origin, apparently, to the remark made by the celebrated African traveller, Bruce, that in Abyssinia and other parts of the east, it is easily so raised. Without wishing to doubt the veracity of so intelligent a traveller, it has been suggested that the statement was most probably a mistake, caused by Bruce's imperfect acquaintance with the language.

Some years subsequently, (1853) the question was revived at meetings of the Society in communications from Messrs.

217. Note on the propagation of the Sugarcane from seed.

W. Haworth and John Thomson and others. The first named gentleman referred to the flowering of the Cane in Ceylon, and the latter to its blossoming in the West Indies. Mr. Haworth presented some seed brought from Kandy. This was carefully tried in the Society's Garden, but entirely failed to germinate.

The result of the enquiry above referred to by the Royal Society of Jamaica was "that no variety of Sugarcane was known to perfect its seed either in the West Indies, China, the Straits of Malacca, Egypt, or even in the South Sea Islands, as in all these countries the Cane is entirely propagated by cuttings.

After so many nugatory attempts to verify the statement of Bruce, it is almost hopeless to expect any reliable information being now obtained in favor of such statement. Should, however, any person or persons interested in Cane culture be able to throw any light thereon from recent experiments, their communications would, no doubt, be very acceptable to the Society.

Notes respecting the cultivation of Munjeet (*Rubia Munjistha*) in Bengal.

WITH reference to the Memorandum on Munjeet or Indian Madder in the current number of the Society's Journal, I beg leave to inform you that a small quantity of Madder is or was within the last few years produced in the district of Bakargunj.

At page 290 of my book on that district, I write that "the Munjeet or Indian Madder (*Rubia cordifolia*) is cultivated in Ujjipur and Shikarpur, in the Gournadi Thannah, and the produce is exported to Calcutta. It is said to be a very profitable crop, and is locally known by the name of Malanchi."

It does not therefore seem hopeless to expect that the

cultivation will succeed in Lower Bengal. In Gournadi the plant was cultivated if I remember rightly, on high land which was divided off into ridges by the digging of trenches.

H. BEVERIDGE.

The Collector of Bakargunj would be able to inform you if the plant is still cultivated.

From the Canungoe of the Sadar, to the Collector of Bakargunj, dated Kundihar, the 31st May, 1881.

WITH reference to your worship's orders of the 30th March, 1881, received by me on the 14th April last, on the subject of cultivation of Muhjeet plant in this district, and other particulars in connection with it, I have the honor to report that the plant is not now cultivated in Ujirpur and Shikarpur as mentioned in the letter from Mr. H. Beveridge, but in villages adjacent to Ujirpur and Shikarpur, in the jurisdiction of the Gournadi Thannah. The names of the villages in which the plant is cultivated, are Atipara, Haishore, Kajera, Khulna, Bohorkattie, Dharmura, Sholack, Moolpaine and their adjacent villages.

The processes of the plantation are as follows :—

In selecting land for the cultivation of this plant, it should be borne in mind that only the extremely high lands, on which, in rainy season, water does not press forward or accumulate excepting the trenches in which alone the rain water is to accumulate, are to be selected. Long parallel trenches of about $1\frac{1}{2}$ cubits broad and $\frac{3}{4}$ cubit deep are to be excavated at a distance of about $1\frac{2}{3}$ cubits from one another. The earth dug out from the trenches is to be thrown along their banks making two narrow embankments or side-walls of about $1\frac{1}{2}$ cubits high between every two trenches, leaving a breadth of 1 cubit original land between the side-walls vacant, and this space is to be filled up as high as the side-walls with pure loose earth (*Dhooli*). After these processes are attended to, the loose

earth is to be made clayish with water and kneaded so as to resemble earth for brick making, but a little softer only, so soft as is required to push down the branches of the tree without any difficulty rather with ease. Branches of the trees are to be cut into pieces leaving only two knots or joints at the two extremities which pieces will not be less than half a cubit long, if cut out of the branches from old trees, and the branches of old trees are to be preferred for plantation. The pieces of branches thus cut out are to be pushed at a distance of five or six inches from one another, into the kneaded earth prepared between the side-walls running along the banks of every two trenches, leaving only about $2\frac{1}{2}$ or 3 inches of the branches above the level of the earth, and then good and pure loose earth is to be dug out of the trench, and thrown over the kneaded earth, only as high as may just cover over the tops or the upper knots of the branches. This being the last process, no trouble is required to be taken afterwards.

The season for plantation is the latter end of cold weather, as rain is wanted about a month and half or two after plantation for the upshooting of new branches.

The roots are used for dyeing red. Too soft roots and too hard roots are useless; so the roots should not be cut out before three years, and after five years from the date of the plantation. The roots become about 1 or $1\frac{1}{4}$ cubits long when fit for cutting out.

When the roots are cut out, they are exposed to the sun for four or five days, then again cut into very small pieces together with the skin or bark of the roots. The pieces then are to be again dried up and powdered and then exported to Calcutta. The price of the powder varies at times, from Rs. 5 to Rs. 12 per maund.

In three years, the plants become as high as $4\frac{1}{2}$ or 5 cubits. If the roots are not cut out, the plants grow up higher and higher up to the height of small trees and live many years.

The tree yields white, small fine leaved fragrant flowers.

The flowers are, however, not used for any commercial purposes.

A piece of branch of Munjeet (manjit) tree and a leaf are herewith submitted for inspection.

AKHIL CHANDRA ROY.

Note on Sorghum saccharatum. : By CAPTAIN J. F. POGSON.

I SHALL be much obliged for some seed of the "red variety" of "*Sorghum saccharatum*," sent you by the Department of Agriculture, N. W. Provinces.

I have come to the conclusion that, by sowing the seed of the Chinese Sugarcane, ("*Sorghum saccharatum*") in the plains at the same time that wheat is sown, i. e. September, October and November, according to latitude, that the seed so sown, will thrive just as well as wheat, barley and oats, and ripen seed at the same season; and as the *Sorghum* canes are quite ready for use, when the seed is ripe, the manufacture of Sugar from the Chinese Sugarcane would follow, and be a success.

I think the sweet juice of the *Sorghum*, sown in the cold months, i. e. after the rains, would be very much richer, in saccharine matter, than the same seed sown before the rains, or just as they commence, and harvested when they terminate. The *Sorghum* plants, raised from seed, sown as suggested, would not be injured by the cold temperature of the plains, and the juice would, I think, be much more abundant and sweeter.

I have shown that, the "*Sorghum saccharatum*" raised by me at Kotegurh, was not in the slightest degree affected by our temperature, which was below freezing point at night, and it follows that growing plants of the same, would stand the mild cold of the plains, from Bengal to Peshawur. The result would be a full crop of ripe seed for use as food; and an abundant supply of canes, rich in juice, ready for expression and conversion into superior sugar.

Under this plan, the "*Sorghum saccharatum*" would become a cold weather crop, giving its seed and canes in spring, and the addition to the Zemindar's income would be very considerable.

I would, therefore, suggest, that all who obtain *Sorghum* seed from the present supply, should sow it, as a winter grain. The land to be made into beds, one rod ($16\frac{1}{2}$ feet) square, and this marked off into circular plots, 18 inches distant from centre to centre, and nine inches in diameter. In each circle, five seeds should be sown and the soil within the 9-inch circle, should be "*limed*," with one dessert spoonful of common bazar *chunam* per circle. The *chunam* to be mixed up with the soil, and the seeds to be sown, as soon as the ground was ready. When the plants are 12-inches in height, a tea cupful of farm yard manure should be dug into the soil, about each group of *Sorghum* plants, and all should then be irrigated. The irrigation to be repeated when needed.

I made use of this quantity of *chunam* with my plants, and you may remember what fine specimens of cane joints I sent you. The farm yard manure equalled one tea cupful per plant.

I had an iron ladle which held as much for a measure.

Notice regarding Cochineal. BY THE SECRETARY.

In an useful memo., (recently published) by Mr. Liotard, of the Agricultural Department, on dyes of Indian growth and production, notices regarding Cochineal are introduced.

This is a subject which, among many others relating to the various industries of India, has been frequently recorded in the proceedings of the Agri-Horticultural Society, commencing so long since as the year 1836. The Transactions of the Society and volumes of the Journal (which superseded the Transactions) in which these notices appeared

being, unfortunately, out of print, perhaps a brief notice of the efforts of the Society in respect to the attempts at introduction of the valuable *Grana fina* and improvement of the *Grana sylvestra*, may be appropriately submitted at the present time, when the subject of dyes generally is again attracting attention.

The efforts that were made at the close of the last century by Dr. James Anderson for the improvement of the wild Cochineal, in the Madras Presidency, were backed by encouragement from the Court of Directors in the shape of an offer of one pagoda per pound for the Cochineal to such of the natives as might be disposed to employ their time in its culture. The cultivation at that time was confined to the indigenous insect (*Grana sylvestra*) which was found to yield a dye equal in brightness to the best scarlet, but four times the quantity was required to produce the same color as that yielded by the *Grana fina* of Mexico.

At the commencement of the present century the Court of Directors offered a reward of £2,000 for the introduction of the *Grana fina* into India. The result of all these efforts were unsatisfactory, and all further attempts in the Madras Presidency appear to have been abandoned. (See *measures which have been pursued by the Court of Directors and the Government in India, with a view to the introduction of the true Cochineal insect into the British Territories in India.*)

In the years 1837-38, the Agri-Horticultural Society of India made strenuous efforts towards the introduction of the *Grana fina* into Bengal. The experiments were conducted carefully but under trying circumstances, and were eventually abandoned. An account of these efforts and the various papers which were submitted at the same time, were published by the Society. They contain many interesting facts regarding the habits and peculiarities of the wild and domesticated insects. It became apparent, however, that the damp and unequal climate of Bengal was unsuited for the successful cultivation of the domesticated Cochineal.

The Punjab and some portions of Upper India would, however, appear to possess a climate better adapted for the rearing of this useful insect, for the Journals of the Society contain several valuable notices in 1849 and subsequently in 1855, from Captain Burnett, Dr. Dempster and others respecting its growth in those localities. The success which attended the trial of *Grana sylvestra* would seem to indicate that the *Grana fina* might be successfully cultivated if the trials had been conducted systematically and perseveringly. It is well known that the coloring matter obtained from the wild insect is not equal by one-third of that from the domesticated, though the color may be equally as bright, while the expense of collection and preparation of the one is as great as the other. It has been well observed that the desideratum as regards our Indian dominions, does not lie in the production of a Cochineal which will dye a fine deep color, but in producing an article which will quantitatively yield a remunerating amount of the dye.

Under these circumstances it is not unreasonable to suppose that with the selection of proper localities for the cultivation of the plant on which the *Grana fina* feeds, combined with carefully conducted experiments, we might hope so to improve our indigenous stock as to make it yield a much larger amount of coloring matter.

The experiments of Dr. Dempster are so far interesting and encouraging. The specimens of woolen cloth dyed with the coloring matter obtained from his insects have, after the lapse of so many years, preserved their fine color. Had the same amount of perseverance and trouble (already referred to) been bestowed by the Society in a more congenial climate than Lower Bengal a more favorable result would doubtless have been obtained; but the time has long since passed to renew profitably, any further experiments in the localities (Punjab) apparently so well adapted for them, for Cochineal has fallen considerably in value. The course of the home

market during the past ten years shews clearly both by the quantities delivered for home consumption (which was only 16,326 bags in 1881, as compared with 32,164 bags in 1871), and by the gradual decline in prices, that the place of Cochineal has been, to a large extent, usurped by synthetic dyes; but still the amount taken last year was very considerable, and the fact that, two years ago, when there was a short crop of Teneriffe insect, it was found necessary to supplement the supply by purchase of lac dye, tends to shew that, at a price, Cochineal still continues to be used in preference to the chemically prepared substitutes.

The question is, whether with prices at their present level, namely, 1s. 8½d. per pound for best Teneriffe, it would be found profitable to cultivate the insect in any part of India for exportation to Europe, and whether while such a plentiful supply is available so much nearer the consuming countries, it would be possible for this country to compete with any chance of profit.

July 1881.

REPORT ON FIBRE OF THE "BURRIALA." (SIDA RHOMBOIDEA).

AT the monthly General Meeting in March 1881 a letter was read from the Secretary to the Government of Bengal, forwarding some specimens of Burriara fibre received from the Raja of Balihar, in the District of Rajshaye, for the favor of a report "on the quality of the fibre and its commercial value and suitability for the Indian and home markets."

Read also the following reports thereon by a section of the Fibre Committee :—

Mr. W. H. Cogswell.—I have been called upon on several occasions, and through various channels, to express opinions on samples of similar fibres submitted to me, and as these alluded to by the Government of Bengal in their letter No. 44 For : now under consideration, are identically the same, viz.,

the "Sida rhomboidea." I think I cannot do better than preface my present remarks with the following report, which I made to the Secretary of the Economic Museum in January of last year :—

"Replying to your No. 2901, of the 13th instant, I beg to say that I have carefully examined the sample of fibre prepared from the Sida rhomboidea, and which I return herewith. I am of opinion that none of the samples have been steeped a sufficient time; those subjected to 2, 3, and 4 days submersion, particularly the former ones, are very imperfectly done, and the best sample subjected to 5 days' treatment, proves insufficient. There is much hard, harsh, barky, gummy substance adhering to the fibre which would have been removed under a more lengthy process. There is also much of what I term croppy ends about some of it, which would not be apparent if the plant had been better matured before it had been cut. I would suggest that some of the longest stems of the plant should be taken, prepared in the usual way, and steeped for 7 to 10 days, about the same time as jute is steeped, care being taken that the steeping or retting process be not carried beyond the above period, as the fibre may become very weak and towy in consequence. A large sample should be prepared, and I will get it tested in one of the Jute Mills, to see what percentage of warp yarn can be spun from it, and a correct value shall be arrived at. There is much in these samples of a soft, bright, glossy, clean fibre, but it is very short in comparison with Jute, barely half its length, the value being very materially reduced in consequence."

These samples now under review are from Rajshay, the same district as those alluded to in my foregoing report, I imagine, and probably from the same source; for whilst in those of the former, I pointed to deficiency of steeping, I have now to remark that some portions of these new samples have been kept too long in the retting process, the result being

that some of the fibre has suffered in strength, and is somewhat towy, or to use a Scotch expression, most pregnant with meaning, it is "fozie" i. e., the fibre is wanting in body, in substance, weight for weight, with that of a similar quantity of Jute. To a few even experienced men, this fibre might be mistaken for that of fine Jute, though not one-fourth of its average length, when deprived of the root ends, as this has been. Its colour is glossy bright in the extreme, and of a very high order. The fibre is strong, fine, round, and of excellent spinning properties, and is well suited for the finest yarns of Jute manufacturers; some of it is so silky as to render it in my opinion fit for higher purposes. I value it at about Rs. 4-8 @ 4-12 per bazaar maund. I think the flax manufacturers at home would be ready consumers of it. The fibre is somewhat more irregular in staple than that of fine Jute, due in some measure if not entirely so, I think, to its treatment in the duration of steeping, drying, and handling afterwards.

I believe this order of plant, the Malvaceæ, is to be found growing wild. Its cultivation, and after treatment, and preparation of the fibre is exactly like that for Jute, and I think it is to be regretted that no data have been furnished as to the cost of its production, and the yield per beegah. It would be necessary to have this, to arrive at its correct commercial value in comparison with that of Jute, when a full opinion is required as to its spinning capabilities, &c., and a reliable commercial value has to be arrived at, it is necessary that very large samples should be submitted for experiment, if proper justice is to be done. Of its suitability for the Indian and Home markets, there can be no two opinions, and the following remarks fully endorse my own views, I am indebted to the courtesy and kindness of Mr. Alexander, of Messrs. Macneill and Co.'s "Ganges" Jute Mill, to whom I gave the samples, to be passed through his preparing and spinning machinery, and the following is the result with the specimens I now submit:—

"I send per bearer the samples of 7½ lbs. yarn one warp,
 "and the other weft, made from the sample of fibre you handed
 "to me last week. There is also a sample of silver from the
 "drawing, and to allow of better comparison I send you a
 "sample of our Hessian Silver taken off the same drawing.
 "The sample we had was so very small, only 3½ seers, that
 "it was with the greatest difficulty we got it made into yarn,
 "which accounts for it being so unlevel. We could, however,
 "judge that there would be no more difficulty in working it
 "than the usual country Jute. There is more gum in the
 "sample than is usually found in the common Jute. It is
 "not quite so strong apparently, having been oversteeped in
 "preparing, and the fibre rather coarser. There is no reason
 "why it ought not to be largely used."

I forward the three samples in question.

Mr. W. Stalkart.—Mr. Cogswell has given such a very full report on these samples of Sida fibre that I have nothing more to add. The question is, can it be produced as cheap, or nearly as cheap, as Jute.

Resolved.—That the specimens of the yarns above alluded to be forwarded to the Government of Bengal with copy of the report.

In connection with the above the Secretary called attention to a report in 1851 on this Sida fibre which was submitted by the then Fibre Committee. The specimens were sent by Col. Hannay, from Assam, and most favourably reported on. Subsequently, a further and favourable report was given on specimens raised in the Society's Garden. These were forwarded to the Chamber of Commerce at Dundee, who intimated that the quantity was too small to admit of a definite opinion being given. (*See Journal of the Society, Vols. 8 and 9, old series.*) Since that time this fibre has been occasionally brought to the notice of the Society.

* * * The above reports were duly forwarded to the Government of Bengal, who sent the following letter with the

intimation that when the result of the experiment which Rajah Kristendro Roy of Balihar proposes to undertake is known, a further intimation will be made to the Society :—

In reply to your Memo : No. 107G., dated the 5th instant, I have the honour to inform your worship that no quantity of fibre is at present available here, and as no cultivation of the Buriara plants is carried on in this part of the district, it is very difficult to ascertain the cost of its preparation. Mr. W. H. Doyly, the late Collector of Rajshahye, ordered me to prepare a quantity of fibres of Burjara plants, which grow here wild in the Jungles. Agreeably to his order, I cultivated three cottahs of land; and then one bigha of land for Buriara plants, but the last rains destroyed all the plants, and for that reason I collected the plants from the jungles at an enormous cost of Rs. 150, and having prepared the fibres at 10 day's steeping, sent them on at the suggestion of Mr. W. H. Doyly, then Magistrate of Monghyr, to the Secretary to the Bengal Government, Agricultural Department.

I shall hold an experiment this year about cultivating the Buriara plants, and inform your worship in due course of the result that follows. In cultivating a bigha of land, I don't think I incur a heavy cost.

Note regarding Gossypium Arboreum, description and produce.

BY CAPTAIN J. F. POGSON.

Now that the attention of the public has been drawn to the subject of cultivating the *Gossypium arboreum*, or "Religious Cotton" tree of the Deccan, the information given beneath, will, I think, be of value to Forest Officers, and European and Native landed proprietors in Oudh, the North-Western Provinces, and the Punjab.

In 1862, Doctor J. Shortt, wrote an Essay on Cotton Cultivation, and was awarded by the Society Rs. 1,000 and a

Gold medal as a prize. I quote from this prize essay in selected and abridged form.

“*Gossypium arboreum.*” Tamil; *Shemparatie*, Hindee, *Nurma*. Is an ornamental species, and in Southern India is generally found growing near Hindoo temples and in gardens, on account of its dark-red flowers. It is characterized by a tall shrubby stem; (*Arboreus*, 1½ to 15 feet, young parts hairy, the whole plant tinged of a red colour; leaves palmated, 5 or 7, lobed, hairy, and dotted, with darkish spots of a dark green colour; lobes deeply intersected; elongated, lanceolate, sometimes mucronate; sinus obtuse; glands one to three; stipules oval; flowers solitary, with short peduncle, red, having a yellowish tinge near the claws. Leaflets of the exterior calyx, cordate, ovate, entire, sometimes dentate, capsules ovate, pointed; three or four celled seeds covered with greenish coloured fir, enveloped in fine silky white wool.”

This valuable cotton tree was introduced into India, at some very remote period of antiquity, from Egypt; and it is to be found in Arabia. It is not a little curious, that the name of Noah’s eldest son, *Shem* is preserved in the Tamil name, “*Shemparatie*.”

The seeds sown by Dr. Shortt, on the 18th June, 1861, germinated freely, and on the 18th July, the seedlings were from six to eight inches in height. On the 18th September, the seedlings *situ* were three feet in height. On the 10th December they were 5½ feet, with bolls forming. On the 18th January, 1862:—“The pods are bursting their cells, and the cotton is in course of being gathered.”

Up to the 18th February, we are told:—“The 40 plants continue to flower and fruit, and the produce has been collected, which yielded 20lbs. of seed cotton, which gave 5lbs. of clean cotton,”

“A neglected single plant of this species, three years old, yielded during 1861 eighteen oz. of the seed cotton, which gave 4½ oz. of clean cotton. Height of plant six feet. It

"continues without intermission to be productive throughout
"the year."

"A plant, eight years old, neither manured, nor cared
"for, is about 12 feet in height, and has upwards of thirteen
"lateral branches, is vigorous and healthy, and produces flowers
"and fruit for the greater part of the year. The produce for
"1861, was 3 lbs. 10 oz. of seed[cotton, and 1 lb. 6 oz. of fine
"cotton wool, silky, rather short in the staple, and of a fine
"white colour."

"The results given above are all from actual experience. The
"natives of the district state that the sacred cotton tree will
"thrive and fruit well for upwards of 20 years."

If Dr. Shortt had given the dimensions in length of the lateral branches, the number of plants per acre could have been calculated. The 40 plants alluded to were grown on 'a plot of ground measuring 30 square yards.' This must surely be a mistake, the side of the square probably was 30 yards in length. A reference to Mr. Duthie, would elicit satisfactory information as to length of branches, and the extent of land to be allotted to each Sacred Cotton tree.

Note.—The "*Gossypium heptaphyllum*," or Saemul Cotton tree of India, is quite a distinct tree, though constantly confounded with the "*Gossypium arboreum*" of the Deccan.

Notices regarding the flowering of Bamboos.

In a brief communication in the last published number of the *Indian Forester*, (Vol. VI. No. 4), a correspondent alludes to the flowering of the large bamboos at Dehra Doon. The following is an extract of his letter :—

"An event of considerable interest is taking place at Dehra Doon this year, and that is, the almost general flowering of one of the large bamboos. Those of your readers who have ever been to Dehra will remember the magnificent clumps of bamboo which border the western side of the

maidan, the old Goorkha Parade Ground. I have ascertained that these clumps were planted from root-stocks in 1851, and that the portion of shoot left above the ground was already then of a fair thickness; that the root-stocks were taken from a clump living in Dehra in that year, but where the original clump is now, or came from the first, is not known.

Another species, with longer and broader leaves, planted here and there in Dehra, but especially near the Bodyguard lines, is not flowering, and there are a few clumps of bamboo resembling, as far as I can judge, the former species (the maidan one) which are also not flowering, but these are exceptions. The great mass of bamboos throughout Dehra will next year have ceased their existence. Specimens will be sent to the Superintendent of the Botanical Gardens, Saharunpore, and to other botanists for determination. Meanwhile, will some of your readers inform us, through your columns, whether there is a general flowering of a large bamboo in other parts of these provinces, or elsewhere.

Two of these clumps were entirely cut down last year, and one of them has sent up one or two thin straggling shoots which are also flowering. The stunted, bushy growth of the other at present shows no signs of it. Again, a cutting from one of the clumps, with a portion of the root-stock attached, was planted out last year to fill up a gap; this, too, is flowering."

This subject has frequently attracted the notice of the Society and many interesting particulars have from time to time been introduced into its Proceedings. As these are not readily available, it is thought that a brief *resume* thereof may be worthy of record at the present time in connection with the foregoing letter. Roxburgh, the father of Indian Botany, alludes in his most useful *Flora Indica*, to several kinds which are known to flower, more especially to *Bambusa arundinacea* (the common "Bans" of the natives), *B. Tulda*

(the "Tulda Bans"), and *B. spinosa* (the "Behar Bans") or thorny bamboo. Alluding to the first, he writes:—"When in flower the tree is generally destitute of leaves, and as the extremity of every ramification is covered with flowers, the whole tree seems one entire, immense panicle, &c."

Referring to the second, he observes:—"Before these trees blossom they must be of considerable age, several years; and even then it is seldom they can be found in this state; at that period the whole plant is destitute of leaves, and forms one immensely oblong, waving, panicle." Again, in respect to the third kind, he says:—"This beautiful, middling sized, very elegant species, I have only found in the vicinity of Calcutta, where now and then some of the oldest are found to blossom about the beginning of the rains, in June."

Buchanan, in his journey from Madras, through the countries of Mysore, Cauara, and Malabar, alluding to the trees he observed in passing through the Animalaya forest, writes thus regarding the bamboo:—"Here are both the hollow and the solid kinds. When fifteen years old, they are said to bear fruit and then to die. The grain is collected by the rude tribe called Malasir, and is occasionally used by all ranks of people. What is reckoned a delicacy among the Hindus, is formed by taking equal quantities of honey and of the bamboo seed, putting them in a joint of bamboo coated outwardly with clay, and roasting them over the fire."

Next we find Dr. Wallich alluding to the subject in a report to Government in the year 1825, in reference to the celebrated grove of bamboos which surround the extensive city of Rampore, in Rohilkund, to a breadth of 30 to 40 feet. "I had heard,"—observes Dr. Wallich,—"a great deal about this unique object, and was therefore the more solicitous to collect all the information I could on the spot. It has been in a state of universal blossoming in 1824, so universal, that there was not among its millions of stems a single one to be seen which was not dead, they were all leaning on each other or

fallen to the ground." After referring to other particulars connected with this general inflorescence, he goes on to state as follows :—" I observed with peculiar pleasure that the Nawab had adopted a very effectual and judicious plan of defending the tender age of the myriads of seedling bamboos which were seen growing on the site as thickly as you can conceive it possible, by not allowing a single one of the old and withered stems to be cut or in any way disturbed. I was told by some old inhabitants that the hedge was reproduced in the same manner forty years ago, (I should have estimated its age at only twenty-five years), and that similar renewals have succeeded each other for ages past.

I found the tree to be of the common unarmed kind, and was surprised to find that the largest even were inferior in diameter as well as in the thickness of the sides."

The late Sir William Sleeman, (then Captain), brought to the notice of the Society, in 1836, the fact of all the larger bamboos in the Dehra valley having that season run to seed and died. About the same time Mr. J. B. Jones mentioned to the Society the fact of the flowering in the Jaunpore district, of a species of bamboo which he stated had been procured from the borders of Oude. Dr. Spilsbury also communicated in 1842, the circumstance of all the bamboos from Jubbulpore to Mundlah having seeded in 1839, and died shortly afterwards.

The age which the bamboo will attain under favourable circumstances, and whether different species have different ages, has never, we believe, been accurately ascertained. Sir William Sleeman, indeed, mentions (*Rambles and Recollections of an Indian Official*) that the life of the common large bamboo is about 50 years, but he does not state his authority for this assertion. However, he remarks that he is not aware of its ordinary age. Dr. Wallich informs us, in his report above quoted, that he should have estimated the age of the Rampore plant at only twenty years, though the

inhabitants stated it to be about forty, that is to say, a flowering similar to that he describes had not taken place for forty years. Mr. Jones remarks that the sign of bearing to which he alludes had showed itself after a lapse of twenty years, and that some very old people could not call to their recollection when it had previously borne seed: This circumstance, coupled with the fact that this bearing is not confined to the more matured plant, both old and young flowering at the same time, would almost lead one to doubt that it follows the regular course by which nature governs the other orders of vegetation; but rather that, as has been observed, it may be encouraged by particular circumstances connected with elemental changes. That great value is attached to the seed as an edible grain, and that it has proved serviceable in a time of scarcity, we have an instance in the following extract of a communication made to the Society by Mr. Charles Blechynden, in 1841:—"In the month of February of the year 1812, a failure occurred in the rice crops in the Province of Orissa. Much distress was the consequence, a general famine was apprehended, and would, no doubt, have taken place, but for a merciful interposition of Providence in causing a general flowering of all the bamboos of the thorny kind, both old and young, throughout the country. The grain obtained from these bamboos was most plentiful and gave sustenance to thousands: indeed, the poorer, and therefore the greater portion of the inhabitants, subsisted for some time solely on this food. So great was the natural anxiety that was evinced to obtain the grain, that hundreds of people were on the watch day and night, and cloths were spread under every clump to secure the seeds as they fell from the branches. Soon after this general flowering had taken place every bamboo died, but the country was not long denuded of this elegant tree, for such of the seeds as escaped the vigilance of the inhabitants germinated in a very short time, and a new race of bamboos sprang up to

supply the place of the former generation. I have been informed that no other flowering has taken place since that period, now thirty years ago."

For the information of those who have not seen the seed in question, we may mention that though it is called bamboo rice, from its having somewhat the flavor and swell of rice when boiled, it has more the appearance of wheat of a very inferior description. It appears to contain a fair proportion of gluten and saccharine matter, a comparative analysis of it with rice and wheat would be interesting. Each plant will yield from 4 to 20 seers of seed according to size and kind. In China the flowering of the bamboo is considered a most auspicious omen. The small, shrubby, unarmed Chinese species, the Keu-fa, of that country, *Bambusa nana* of Roxburgh, which makes such beautiful close hedges, and which is not uncommon with us, has never, that we are aware, been known to blossom in Bengal; neither the beautiful green striped Chinese variety; nor the gigantic Burmah kind. Has the latter been known to blossom in its native country, or in Arracau?

'Many years after the above particulars had been communicated to the Society, Col. C. S. Ryder, writing in 1872, from Jubbulpore, observes as follows :—

"Now have you ever heard of this. If, when those beautiful clumps of bamboo flower and seed, they die, we have lost one of the great beauties of the station. I was told two or three months ago, that if you cut the bamboos down to somewhere near the ground when they are flowering, they grow up again and do not die. I wish I had known it a year earlier, I might have saved our grand clumps, some of them 50 to 60 feet high. Perhaps it might be cut down only a foot or two below the flowering part, and it would do as well or better. I think it would be well if this was more known than it is. The bamboos that are cut are all in prime order for my use. If not cut down in time

they seed and the bamboos die, roots and all. I had two small but very pretty clumps in the public gardens which had escaped last year, when almost all the bamboos died. They began to flower and I thought of their cure, cut them down leaving a foot or two feet above the ground. They have both thrown out long thin shoots from what was left, and I consider they have been saved from a certain death, and will grow now for the next 30 or 40 years."

Mr. John Scott, of the Royal Botanic Garden, to whom Col. Ryder's letter was referred, furnished the following particulars :—

"With reference to Col. Ryder's remarks on renewing the life-term of bamboos by cutting them down while flowering, I should think it can be but temporarily. Since I received Colonel Ryder's letter from you, I have been looking to the several specimens of *B. spinosa* which are flowering in the Botanic Garden here, and I observe that many of those which have had a few of their clumps lately cut down in place of giving rise to leaf-shoots only are all flower-bearing even as the last and preceding year shoots. Now, though these clumps were only in part cut, I see no reason why they should all give rise to flower-shoots, if in the case of cutting down a whole flowering clump, leaf bearing shoots only spring up. I have, however, made the experiment and shall in due course report the results with other observations which I am making on the flowering of bamboos. In the meantime I may state as partly confirmative of Colonel Ryder's authorities, that, as it happened, two clumps of *Bambusa spinosa* were completely cut down about a year ago, and that these are now the only non-flowering specimens of that species in the garden here. How long they may continue non-flowering, remains to be seen as showing that those would have flowered if left uncut. I may state that many of the cut clumps were buried lengthwise along one of the garden boundaries with the view of raising a

fence from them, a not uncommon mode of multiplying bamboos. They succeeded well, and in the second year gave rise to vigorous shoots, which like the uncut clumps of the original progeny have all burst into flower. This remarkable fact shows how strongly the individuality is retained; so it is also by root division."

In a subsequent communication, Colonel Ryder announced that the stumps from which he had cut the bamboos had thrown out branches, or rather shoots, which flowered uncut, so that will be of no use. Mr. Scott observed that he suspected what the result would be with the cutting down of these flowering bamboos; the flowering effect is a concentrated and exhausting one, and he should have anticipated that it was then too late for any chance of renewal from cutting the flowering shoots down; the casual observation, however, in a previous letter shows that if cut down prior to the commencement of flowering, the life of the plant may be temporarily prolonged.

A. H. B.

June 1881.

Minute on the improvement of Agriculture in the District of Bijnor. By P. SRI LAL, SECRETARY, BIJNOR AGRICULTURAL SOCIETY.

THE sole aim of the Bijnor Agricultural Society being to improve the agricultural conditions of this district, and its primary objects having been set forth to be (1) the communication to landlords and cultivators of information about improved agricultural implements or processes, (2) the exhibition of new implements or processes, (3) the supply of good seed to cultivators, (4) the improvement of stock, and (5) protection from drought, I propose to point out in this short minute what practical steps might be taken in each direction to attain the desired objects, and I would accordingly touch upon each head in order.

I

COMMUNICATION OF USEFUL AGRICULTURAL INFORMATION.

In connection with this subject it is to be carefully borne in mind that no implements or processes are to be recommended whose intricacy or cost is a bar to their general adoption. So far this essential point has been steadily kept in view, and the Institute has imparted information in respect of such agricultural implements or methods only as are within the reach of all classes of the cultivating community, and are, as such, likely to be appreciated by the general public. Amongst the papers that this institution has issued during the eleven months of its existence may be named those on (1) bone-dust and cattle-urine manure, (2) deep ploughing (for which the *kaisar* plough of Cawnpore is remarkably fitted), and (3) selection of seed, which are by no means unimportant factors in producing an abundant crop. Some members of the society have, I have reason to believe, taken exception to the bone-manure, not, in any respect, on the score of religious prejudice in handling bones, but because their limited quantity and comparatively high outlay in their conversion into manure, render the latter inaccessible to the poorer classes. This is, no doubt, to a certain extent true, and although it is abundantly necessary that the lower classes of the rural population should form the first subject of consideration at the hands of the Society, it is none the less an equally important object of the Institute to introduce agricultural reform among the large landed proprietors, without whose co-operation and combined action nothing can be done in the way of developing the practically unlimited agricultural resources of India. And it is all the more so, since we observe that there has set in a retrograde tendency among large landholders to give up the cultivation of their home farms, and lease them out like the rest of their lands to their tenants or cultivators. This is a radically wrong move and must be discouraged on all sides. To meet adoption on an

extensive scale new and improved methods of cultivation must first find favor with the proprietors of large estates. The poor classes would, of course, hesitate to introduce them on account of their pecuniary inability to run the risk of failure until their success and usefulness are fully verified, and this object can only be gained by means of farms on large estates which should give a fair trial to each new agricultural implement or process, and thus make their fields a model farm for their cultivators. This appears to me to be the only practical mode of ensuring the co-operation of poor landowners or cultivators.

Now to revert to the point at issue, it is *never* the desire of this Institute that bone manure should be off-hand adopted by one and all classes of cultivators to the exclusion of all other manures but, on the other hand, that large landholders alone should first test its usefulness and advantage, and since it is the most effective manure adapted to the staple crops of India, such as wheat, barley, maize and sugarcane, it has the foremost claim on the attention of an Agricultural Reform Society like the Bijnor Agricultural Institute. As soon as the cultivators perceive that the bumper harvests the crushed bones yield repay them many times over for the somewhat high outlay in their preparation, they will assuredly resort to their use and turn out to pick up raw bones in every nook and corner where one could get hold of them. In the meantime there are other, and by no means inferior kind of manures within the easy access of the whole rural community which might be profitably utilized, but which have hitherto met with but scant attention at their hands. Among the latter may be mentioned the dung of man and beast, urine sweepings, dead leaves, indigo refuse, and salt earth or water.

II.

The Institute does not rest contented with the bare communication to landlords or cultivators of useful agricultural

information. It does something more to convince the people of the truth of what it circulates in black and white: in other words, it gives itself a fair trial to each agricultural implement or process that comes under its notice. With this view there is established a farm where *Rabi* experiments are at present being conducted, both on the improved and old systems for the purpose of comparing their respective outturns, and thus determining the comparative value of both.* One part of the farm has been worked up with the *kaisar* plough, manured with bone-dust, and sown with the fine and selected wheat-seed from the Meerut district, while the other portion is treated just as a common cultivator would treat his own crops in similar cases.

The implements which the Society has brought to public notice are (1) the *kaisar* plough, (2) the Beheea sugar mill, (3) the Cawnpore winnowing machine, and (4) a cheap and useful waterlift.

The usefulness of the *kaisar* plough is established beyond all doubt, and many cultivators to whom it was exhibited have returned the verdict of its superiority over the native plough. The only objections they make are that it is, in the first place, a little too heavy for the ordinary bullocks employed by the poor classes of cultivators, and, secondly, that its price is such as each cultivator cannot easily afford to spare.

The first objection loses its weight when one properly attends to the instructions for its use, which provide that "it can easily be adjusted so as to suit soils of any consistency or bullocks of any height," and which further add that "if the point of the plough has a tendency to dig down into the ground and the plough travels on its point, take out the wooden wedge on the beam and shift the standard back along the beam, towards the handle."

"This will lift the point up.

"If, on the other hand, the point has a tendency to run up out of the ground, shift the standard forward along the beam.

"This will depress the point.

"If the plough be not properly adjusted the draught is much heavier on the bullocks than it should be." To meet the second objection, I would suggest that ploughs similar to the *kaisar* implement be manufactured at Bijnor where they would not probably cost more than Rs. 4 apiece, as their cost at the Cawnpore Workshop including a little profit does not exceed Rs. 6. And then the ploughs, so turned out, might be sold at cost price as well as let out on hire to such bodies of the agricultural community as might not even then be able to purchase them with ease.

The Beheea sugar-mill.—The utility of the Beheea sugar-mills is admitted on all hands and although their price is a slight bar to their introduction, they are gradually extending throughout the district and are slowly superseding the native *kaulus*. The mills are in every respect superior to the latter, and turn out a much greater quantity of *gur* at a considerable saving in outlay. Messrs. Mylne and Thomson of Beheea, to whom the country and especially the agricultural masses are indebted for this useful invention, have of late established a dépôt at Dhampore, situated in the heart of the cane-producing portion of this district. They adopted a very wise and practical plan to secure their introduction into the district by issuing them at first on a moderate hire, perhaps 8 annas a day, until the demand for them increased to such an extent that the dépôt had not only to raise the charge, but even to summarily stop their letting out on hire and substitute the system of sale in place thereof. Although Messrs. Mylne and Thomson would continue to pursue their present course, still in view of their more rapid extension, I would propose that the Society or some of its well-to-do members also purchase a good number of these mills and then let them out on hire at a fixed and uniform charge.

The winnowing machine and waterlift.—None of these, though indentified for, have yet been received by the Society.

They will, however, be fairly experimented with in due course of time, the former probably at the present *Rabi* harvest.

III.

SUPPLY OF GOOD SEED TO CULTIVATORS.

To secure this object the Institute might, on the one hand, undertake to obtain good seeds of each crop from all parts of India or even a foreign country that might be especially well-known for them, while on the other, it might fully impress upon landowners and cultivators, the necessity of using excellent seed in place of the indifferent kind they indiscriminately resort to at present. The proposal might at first sight appear a little inconvenient to the cultivating population, who under the present state of things store away a portion of their *Rabi* and *Kharif* harvests for their future sowings: but on a little consideration it will be seen that my suggestion hardly affects the present system if the cultivators would but choose to send down their respective quota of seed grain to the Bijnor Institute, and get it exchanged there with the best possible seed at a fair commission in kind to keep up the balance between them.

Cultivators too, it might be supposed, might be unwilling to barter their own quantity at a discount, but I may safely state that they would scarcely hesitate to change quantity for quality when they gathered the profitable crops which good seed brings in, and which would go to more than compensate them for the so-called loss they might at first be subjected to. In view of all this, I am in communication with the Department of Agriculture and Commerce and some of the Agricultural Societies in India, and am making enquiries as to what parts of India are particularly noted for the seeds of those staple crops which form the chief cereal growths of this district. In course of time, I hope to be able to place before the public a list of the principal crops of the district, side by side, with the names of the places whence best

seed might be procured for each. In relation to this subject the importance of holding agricultural shows cannot be too strongly advocated, and I am glad to add that the question is under the consideration of the Managing Committee of the Institute.

IV.

THE IMPROVEMENT OF STOCK.

This is a subject of the utmost importance but hitherto most deplorably neglected. The entire body of cultivators appear to be laboring under the sad mistake that they could best utilize their cattle in agricultural operations without giving them anything in return.

The consequence of this fatal blunder is fast becoming manifest, and it is high time that the progress of deterioration is arrested, and measures adopted to remedy the evil. The most essential auxiliaries to the improvement of cattle are:—(1) the supply of good bulls for breeding purposes, (2) the supply of excellent fodder, and (3) measures for the prevention of cattle disease.

The several points enumerated here have long engaged the attention of Government, but no definite conclusions have been arrived at, probably due to the apathy shown to the subject by those whose interests are concerned therewith. Agricultural improvements have as much to look to the public for support as to the Government for assistance. Neither can advance agriculture without the co-operation of the other. The Government of N. W. P. and Oudh has, at the instance of the Department of Agriculture and Commerce, devised the system of distributing first class bulls to land-holders and zemindars interested in the improvement of stock: the terms being either to buy the bull outright for Rs. 160: the cost which Government incurs in purchasing it at the Hissar farm and transporting it thence, or to hire the bull for the first year at Rs. 16, and return it to the Government on the expiration of that period. These are

liberal terms no doubt, but this stray distribution of bulls cannot, I think, effect the improvement of cattle in a general way, unless the land-holders who get such bulls devise special measures for their utilization. The Committee of the Institute, Raja Jaggat Sinha, and the Sherkot estate (under the Court of Wards) have all indented for the Hissar bulls, and many other well-to-do members of the Society would have likewise applied for them on either term if the conditions were made known to them: for so little time was allowed to the Committee by the department of Agriculture and Commerce to submit a list of the intending applicants for the bulls, that the Committee had not enough time to communicate their plan of distribution of the animals to the members of the Society, and get their replies in time to prepare an approximate estimate for the whole district. The Institute would, however, be in a better position in this respect should the system, as it is hoped, obtain next year. For all that I am not aware as to how the breed of cattle of a whole district could be improved even if as many as fifty bulls were distributed throughout its extent. The direct advantage could only reach the immediate recipients of the bulls or perhaps their neighbours, though here, too, I am not certain whether they would allow a bull which they keep at their own expense to serve the cows of others who do not contribute a single farthing towards its keep.

A partial solution of the problem lies in my opinion in the institution of a cattle breeding farm for which some parts of the district abutting on the forests afford great facilities on account of their abundant pastures. The idea could therefore be practically carried out in two ways. Either that the Institute might establish a farm under its own management by placing in it, at starting, a limited number of cows, along with a few strong bulls for breeding purposes. The requisite number of cows to be easily collected by inviting each individual member of the Society to furnish at least one cow, so

that making allowance for such as might not be able to spare their stock, the entire roll of members (110) could easily raise 80 head of cows, a fair number to begin with. The scheme might seem *prima facie* a little crude but there is really nothing impracticable in it, inasmuch as there is a common practice among land-holders of sending out their live stock to the villages which are known to contain grazing grounds and allowing them to remain there until the supply of grass is quite exhausted and nothing is left to feed upon. The cows so obtained might be kept for two years or so and then returned, together with their calves to their owners in lieu of course of other cows to ensure the continuance of breeding operations and the gradual development of local breed of cattle. I may also note parenthetically that in order to keep each individual member regularly informed regarding the condition of his particular cow or cows, as well as to assist the Society in many respects, each animal might wear a ticket bearing the name of the owner. The expenses of the institution at the outset would be those required for the purchase of bulls and the maintenance of an establishment in connection with the farm. And this cost of carrying out the scheme might be conveniently met by means of uniform subscriptions among the members who might be willing to join in the farm. It is assumed here that the Government on its part would encourage the step by the free grant of a site for the purpose. It may be also noted that in the second and subsequent years the ordinary expenditure would fall short of that of the first year by the amount expended on the purchase of bulls.

Or secondly, that a cattle improvement company might be floated with a limited capital divided into a good number of shares of moderate amounts. The capital raised to be devoted to the establishment of a cattle-breeding farm by procuring a reasonable number of bulls and cows. These latter would yearly give out a handsome produce of bullocks which, when young enough to work a plough and after being

a little broken in, might be sold by auction at a conspicuous place in the district on some fixed dates towards the beginning of the seasons *Rabi* and *Kharif*, when bullocks are in great demand. They might be also let out on hire in especial cases. I am confident the speculation would prove a remunerative one, and would in addition confer a two-fold advantage upon the agricultural community : namely, (1) the supply of a sturdy breed of cattle, and (2) the comparatively cheap price at which they might be obtained. I am prepared to submit more elaborate sketches of the two schemes should they meet with the approval of the Society.

The next point of equal importance connected with the improvement of stock is that of the supply of good fodder, a subject to which the cultivating classes pay but little attention. They are possibly not aware that the fearful mortality that every year sweeps away thousands of cattle is, in a great measure, due to the want of sufficient fodder at all seasons of the year. But now that zemindars and cultivators have begun to interest themselves in agricultural reform, it is absolutely necessary that practical steps be at once taken towards the promotion of grass reserves, cultivation of root-crops, retention of oil cake, improvement of indigenous fodder plants, and the introduction of new ones. The sorgho, lucerne, reana, and mangold, fairly stand the climate of this district and their cultivation as such should be more widely extended.

The third step in this direction should be the adoption of measures for the prevention of cattle diseases, and in regard to this subject I would propose that a cattle medicine dépôt be established at Bijnor under the supervision of the Secretary to the Institute. It would be also interesting to know that it is in contemplation of the Institute Committee to issue at an early date, an exhaustive list of the diseases cattle are liable to suffer from, along with their effective remedies. Such a pamphlet would materially assist the cul-

tivators and zemindars in successfully curing the worst forms of cattle disease.

V.

PROTECTION FROM DROUGHT.

Now the last and by far the most important point connected with the advance of Agriculture, which remains for me to deal with in this minute is the subject of irrigation. The constant occurrence of famine has well-nigh impoverished the Indian cultivators, and this poverty is apt to further danger unless provision is made to meet the irrigational wants of this country. The subject has been the cause of much anxiety to Government and various schemes are under consideration to facilitate the means of irrigation and prevent the periodical visitations of famine in India. Up to a recent date it was generally believed that the construction of canals was the only effective means to avert famines, but a theory has of late set in that although canals fertilize lands for the first few years, their deterioration from the effects of *reh* also begins at the same time, which in the space of a few years, renders the land totally unculturable. Moreover the circumstances of this country at present do not permit of the construction of a network of canals throughout the peninsula. The most practical measure that our local Government has at length devised to successfully combat with famines is the system of State wells which, though still in its experimental stage, promises to prove one of the best means of improving the condition of the agricultural population. The Government is seriously engaged in preparing a scheme for the adoption of general measures for the province. As bearing upon this subject I cannot help thinking that the best machinery to employ for the construction of State wells is to be found in the Engineering Department of the Government, for there are, as Mr. Buck observes in his last Administration Report of the Department of Agriculture and Commerce, in the first place, many tracts in which wells can and ought to

be constructed, but in which the land-holders, if entrusted to carry on the work, will from apathy or other causes take no measures to construct them and, in the second place, there are localities, and not a few in number, in which engineering difficulties, too great to be met by rude native contrivances employed in well-sinking, would be easily overcome by such scientific appliances as a Government Department could supply, and thirdly the object of Government in providing funds for constructing wells would not be gained unless it could be assured that the wells constructed were of a character which would guarantee permanent irrigation.

Mr. Alexander, Settlement Officer, Moradabad, has pointed out that there are four classes of wells for Government to construct :—

- (1) Zemindars to purchase wells outright.
- (2) Zemindars not to purchase but to manage and pay interest on outlay.
- (3) Zemindars not to purchase or manage but guarantee a minimum return.
- (4) Constructed by Government on speculation without any promise or guarantee.

If the construction of State wells would be based upon these suggestions, it might be safely presumed that the project would give universal satisfaction without entailing any pecuniary burden upon the agricultural classes. Experiments with these wells are being proceeded with in the Moradabad district, and I believe that as soon as Government is prepared to give the scheme a general introduction, the next scene of operations would be our own district, adjoining Moradabad, as it has a greater claim to Government assistance in consequence of the agricultural interest it has of late evinced. It would be as well to notice that Raja Jagat Sinha has, by way of experiment, undertaken to construct a well on the new system propounded by Mr. Bull, C. E., and successfully introduced by Mr. Wyer, C. S., into the Dibari Estate in

the Azamgarh District. If the experiment succeed, endeavours will be made to secure its general introduction. As another step in this direction the Agricultural Department has brought out a cheap waterlift which also appears to give a great stimulus to the irrigating power in this country. The Society might also encourage cultivators to make artificial tanks and reservoirs where natural facilities exist for the same: as these would also be directly useful for irrigation.

SUMMARY.

I would now summarise my various proposals embodied in this Memorandum; they are:—

(1) That the attention of the cultivating community be drawn to the sundry kinds of manure that lie so to speak at their very doorsteps, but of the value of which they have little or no conception.

(2) That ploughs similar to the *kaisar* plough of Cawnpore be manufactured at Bijnor and sold at cost price as well as let out on hire to secure their general adoption; also that steps should be taken to extend the use of (1) Beheca mills, a good lot of which should be purchased and given out on hire, (2) winnowing machines, and (3) waterlists.

(3) That the Society manage to supply the agricultural classes with good seed of all crops wherever it could be procurable.

(4) That measures should be devised to improve the local breed of cattle generally, and that the establishment of a cattle breeding farm in a carefully-selected situation near the jungle should form a part of such schemes. That to obtain a better supply of fodder, effort should be directed to promote grass reserves, cultivate root-crops, retain oil cakes, improve indigenous kinds of fodder plants and introduce new ones, such as surgho, lucerne, reana, guinea grass and the like: and further that the medicines for the several cattle diseases be made accessible to the agricultural classes with a

view to their prevention by means of a cattle disease medicine dépôt at Bijnor.

(5) In connection with the subject of irrigation, Government be induced to extend the system of State wells, as it seems to be the best means of ameliorating the condition of the cultivating population.

The latter may be also persuaded to make artificial tanks and reservoirs.

(6) And lastly that an agricultural show should be held at Bijnor this year, being a most efficient means of creating interest in agricultural matters and enlisting the active sympathy of zemindars and cultivators.

In conclusion, I beg to add that should this minute, incomplete as it is, meet with the approval of the Committee of the Institute, I would propose that it be circulated among the Members of the Society in order to elicit their opinions upon the several points noticed in it. I believe there are a few gentlemen, especially among the Honorary Members, who have long been known to take a keen interest in Agriculture, and an expression of their wholesome views would add great weight to my several proposals, provided the latter appear to them sound and practicable.

Report on Jute raised in Egypt. · By W. H. COGSWELL, Esq.

I HAVE been asked to express my opinion on the quality of the accompanying two samples of Jute, said to have been grown at Shubra, near Cairo; the larger one having been prepared by the ordinary Bengal process, and steeped in muddy water for ten days, the smaller sample was similarly treated in all respects, with this exception, *viz.*, that after the plant had been cut, but prior to its being subjected to the usual retting process, it was passed through a patented machine called "Garwood's" patent, and the stems were macerated, that is, the bark was separated from the pith or

stem of the plant, the belief being that by such mechanical preparation the steeping process would occupy much less time than is usual, and that when the bark is put bodily into the water, thus freed from the stem, the retting would be facilitated. I am, however, of opinion that the plant, when cut, and then steeped, with all its chemical, sappy, properties intact, would decompose much more readily and rapidly with the stem intervening, and produce a softer spinning fibre, with the embodiment of all its essential oil permeating it.

Apart from this, the cost of the machine in the first instance, and its maintenance in perfect working order, would greatly add to the cost of the finished fibre. Again, the cultivation of Jute is entirely in the hands of natives, who could neither afford to invest in such a machine, nor have they the needful mechanical skill within range to repair any breakage, or adjust any irregularities in its working; their process being very simple, inexpensive, and most effective. Time not being reckoned much of an element with the ryots, any saving under this head by mechanical skill would not receive their consideration in the least.

It is almost impossible to express a thoroughly reliable opinion on such very small samples submitted, and if any good practical results are to be the outcome of such enquiries, I would suggest that a very large sample, or a small bale, should be forwarded.

The smaller of the two samples being somewhat similar to the larger one, but not in sufficient quantity to particularize, I treat with the other, the staple of which is of good length, but hard, harsh, and brittle, not unlike the *meshta* (*Hibiscus Sabdariffa*) fibre of this country, deficient in color, wanting in desirable spinning properties, and would require to be mixed with other good Jute to make suitable yarn from it. Its preparation is here and there defective, and the fibre would have come out better, had the retting process been continued longer; parts of the plant, I think, were not fully matured.

The roots have been cut off. It would have been desirable to have left them on, as a better opinion could have been formed generally. I think the seed from which this plant has been grown is from a common description.

I see in "Le Cultivateur," of Cairo, dated 1st June, allusion is made to the culture of this Jute in Egypt. It would be most interesting to know hereafter with what results its introduction has been attended. That it will grow has been proved, not only in Egypt, but in other countries, apart from Bengal; so will it grow in Europe, under glass: but what is of such vital importance, I may say the main element to its success, as a financial scheme, and from the only practical point that the mercantile world would view it, is, can it be produced to pay? Every effort should be made to test that. The seed may be good, the soil everything that could be desired, the labor good and skilful, and the seasons regular, but if irrigation is to be a necessity for the well-being of the plant, and to form part of the cost of cultivation, and a humid atmosphere must be a *sine qua non* for its fructification, then I am afraid that such practical experiences will bar its progress. I think the climate of Egypt is too dry for such an undertaking to prove profitable, and that none but a similar climate to that of Bengal, with its constant moist atmosphere, a species of vapour bath, its alternate showers and sun-shine during the period of the growth and maturity of the plant, will bear good and profitable results, in my humble opinion.

I think, however, that every effort should be made to test the capabilities of the climate by the selection of the choicest seed, the best land, and the treatment throughout to be assimilated as closely as possible to that of the *modus operandi* adopted in this country.

November, 1881.

*Notes on the cultivation of the Grape Vine in Cashmere. By
MONSIEUR ERMENS, Director of Agriculture to His Highness
the Maharajah.*

CASHMERE is essentially a wine-growing country, and the richness of the soil is admirably adapted for vine cultivation. His Highness the Maharajah engaged me specially for the cultivation of the vine as well as for the manufacture of wines and spirits. I arrived in Cashmere in 1876, and selected the Shirmencha slope as the most suitable for vine cultivation, because the soil appeared to me suitable, and also because of the certainty of procuring water for irrigation purposes.

In Europe water is no great object; but in India the soil dries up so quickly that water is indispensable.

I began by planting in 1877, and the cuttings all came from France and from the best districts, the names of which are as follows:—Margaux, Tabernet, Sauvignon, Cabernet, France, Malbec, Merlot and Verdot. These are the fine varieties of vine, the wine of which is known in the trade as Margaux, Chateau-Lafitte, &c.

The other cuttings come from Chateau-y-queem in two varieties, the Semillion and the Sauvignon. The grapes of these are of a very fine quality, and yield a superior class of wine, Chateau-y-queem being, as you are aware, the finest white wine in the world. You will notice that I have taken cuttings from the best vines, and I have been highly successful, as on the 3rd year, I gathered lots of grapes and made an abundant harvest—a thing not to be done in France under five years. The wine made has lasted and been found excellent. This wine will have acquired all its flavour in 1883, and then be sold in the open market at a low price compared with French wines sold in India.

His Highness the Maharajah has given to the Principal Officers of his Court large tracts of land to be devoted to vine-cultivation. This land is next to my first plantation, and here vine-growing has a magnificent future, especially

now that French vineyards suffer so terribly from blight. Another question of no less importance is that of spirits and alcohol. His Highness has gone to considerable expense for his distillery, and the same apparatus is used as in Cognac. Fruit is found in abundance in the forests, the only trouble being to gather the fruit in time so as to prevent its being eaten up by bears. This year large quantities were gathered and dried so as to reach me in good condition, and fit for distillery purposes.

This fruit is put in large vats in tepid water, and allowed to ferment 12 to 14 days. At this season of the year it takes this time, but in summer eight days are long enough. This new industry is likely to prove most successful and to yield a large income to His Highness, whilst it proves to be of great advantage to the people living close to these forests, as they receive in exchange for the fruit they gather, money and rice. His Highness the Maharajah has given strict orders that there should be no delay in paying the people, and he has ordered me to visit the districts from time to time in order to see that his orders are carried out. This of course means that His Highness takes a very lively interest in his people, and that he does all in his power to promote their welfare, although this is not the opinion of many who do not know His Highness and his goodness of heart for all. But I am able to judge of the Maharajah's kindly disposition, having been in his service for the last six years; and I can state how happy he was when during the famine I could suggest the making of roads and canals with a view to affording relief to the distressed people. The distilleries were put up during the famine and many thousands of poor famine-stricken souls have had work given them by this means, and have thus been saved from the jaws of death.

November, 1881.

Successful result of cultivation of Reana luxurians in the Chattegurh Division. Communicated by COL. C. B. LUCIE SMITH, Commissioner of the Division.

WITH reference to the correspondence ending with my letter No. 5257, dated 5th October 1880, I have the honour to report the result of the experiments made in this Division with the 3lbs. of the seed of the Reana luxurians, which you were so good as to send me in October 1880.

The consignment reached me after the rains of 1880-81 were over, but as keeping it until the succeeding monsoon would have risked the destruction or deterioration of the seed, I sent 1lb. to each of the Deputy Commissioners of Raipur, Bilaspur, and Sambalpur, together with a copy of the printed directions, and begged them to put down the seed at once, treating the crop if necessary as an irrigated one, the object being to obtain a quantity of fresh seed for sowing during the rains of 1881-82. The seed at Raipur is stated not to have germinated, but in the other two Districts it did excellently. Thus under date the 13th June last, the Deputy Commissioner of Bilaspur writes: "though the proper time for sowing it is the commencement of the monsoon the half pound of seed sown at the end of October 1880, gave a really excellent crop. The irrigation was thorough and the plants grew to an average height of 5 feet, many reaching 6 feet. The stalk of those fuller developed was two inches in diameter, and the ears were in most cases not less than five in number and were very full. The appearance of the crop was remarkably healthy, and as desired by you the whole of the seed will be sown shortly;" and writing on the 19th April 1881, the Deputy Commissioner of Sambalpur stated that the Reana luxurians had progressed favourably, some of the plants reaching a height of 5 feet, and that seed had been collected for future sowings.

Considering then that such good results were obtained from seed put down out of season, we have grounds for

believing that with sowings at the proper time the *Reana luxurians* will thrive well in this Division; and during the current year the weight of forage obtainable from it and the cost of growing it per acre will be ascertained.

RAIPUR, 31st October 1881.

THE GARDENER'S NOTE Book, No. 26.

Directions for sowing Pithecellobium saman seed and for treating the young plants. By DR. G. KING.

THE seeds of *Pithecellobium saman* should be sown at intervals of 2 inches apart on ground which has been previously dug to a depth of 12 inches.

The seeds having been sown as above, $\frac{1}{4}$ inch of soil should be sprinkled on them. No water should be added for three days, but watering should then be commenced, and be carried on sparingly for a week and subsequently freely. The seed will germinate within three weeks.

When the seedlings have grown to a height of 4 or 5 inches, they should be transplanted into beds prepared as for the seed, and so situated as to secure that the young foliage be not too much exposed to the sun. The plants should be put out at intervals of 15 inches and should be freely supplied with water. Manure is quite unnecessary at any time. The plants may remain in these beds until they attain a size suitable for putting out in the sites which they are intended permanently to occupy.

• *Plan for writing on wood labels with indelible ink.*

By CAPT. J. F. POGSON.

How to write on wood with indelible ink. The object in view being to secure tallies for pot plants and seed sown.

1st.—Get a carpenter to saw a lot of laths out of any white wood plank such as the planking of claret, wine, and brandy, one dozen cases.

2nd.—Cut to size required, and point one end with a brush, apply a solution of soda to one or both sides of the surface of the other end, and dry in the sun.

3rd.—The wood so prepared, may now be written on with common “marking ink,” and the writing is permanent.

4th.—Rub down some Indian ink with water in a saucer when the color is dark enough, pour into a small bottle with a widish mouth. Into this solution drop one or two crystals of “nitrate of silver” (lunar caustic,) and when dissolved, try the ink on a prepared slip of wood. If the slip written on into the sun, and if the writing is not quite black, add some more “nitrate of silver,” when the end desired will be obtained. Cork the bottle and keep for use. The bottle being wide-mouthed acts as an inkstand.

5th.—Cards and card board if treated on one side with the aqueous solution of carbonate of soda (the washing soda of commerce) after being sun-dried, may be written on with the above ink, and then nailed on to boxes, and pieces of long cloth similarly prepared and written on, and nailed on to boxes, sent by bullock train or railway, affords the best of direction labels.

THE GARDENER'S NOTE Book, No. 27.

A few hints on the cultivation of Roses. By LIEUT-COL. J. MAY.

THE first and most important point to be considered in making a rosery in India is the watering of the plants, hand watering is useless, they must be flooded and the well should be close at hand; roses are thirsty, hungry things, and need lots of water for they love to be kept cool at the root in the heat of summer.

To ensure flooding with facility the beds should be three inches below the general level with a slight fall from the drain. Simplicity is much to be desired in the plan of a rosery. As an

example of extreme simplicity I subjoin a plan of the rose garden I have made at Chuprah and Dinapore, which have answered admirably at each place. It consists of oblong beds two feet wide with grass turfed walks three feet wide between which are always green from the moisture they obtain from the flooding of the beds on either side. The beds can be made any length, and this will depend on the extent the water can be let into the greater side of the centre walk, which should not be less than five feet in width.

Another matter of importance is to have no trees in or near the garden, as the roots of large trees absorb the moisture, and the result is very undesirable. All plants both flower and fruitable thrive best in the open air.

The plants should be allowed to grow as they like, and as much root as possible during the rainy season, and should not be pruned until you are certain that the cold weather has set in, and this will entirely depend upon the place you are in. I used to prune in the beginning of October when I commenced rose gardening, and learnt from experience that it was a mistake, as I found one year that the half of my plants which were pruned a fortnight later than the others flowered the best, and since then I have never pruned till the beginning of November, generally the 10th which I consider the proper time in these parts. If the plants are pruned before the cold weather has actually set in, a few days warm weather, which I have often known about the end of October, will scorch the new shoots. After pruning I expose the roots till the new shoots are well out, and then fill in with well sifted and decayed horse manure, the older it is the better, and flood twice a week until the buds are well out and full, when watering should be discontinued. In the hot and dry weather the plants should be flooded at least three times a week.

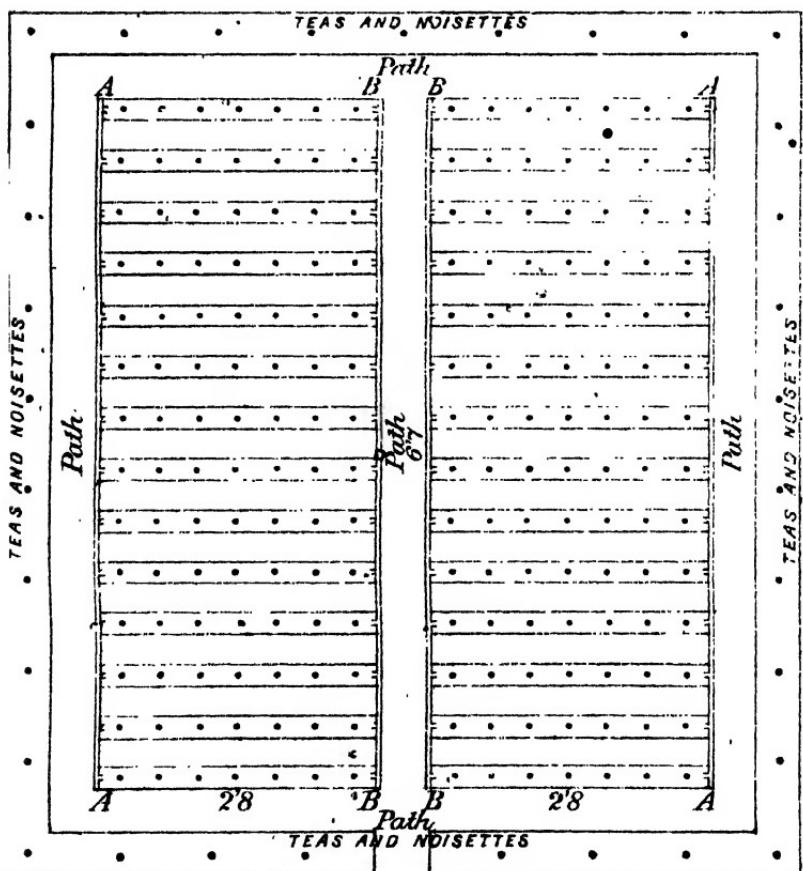
I have found that opening the earth round the plants at least twice a week makes them grow more than anything, it

allows the air and manure to get at the roots. The malees should not be allowed to break the clods opened with the "karpee," but should let them remain as they are.

The greater the above attention is paid to the plants during the hot weather and rains, the greater will be the satisfaction in the cold weather.

DINAPORE, December 1881.

PLAN OF GARDEN—Scale 10 feet to an inch.



Hybrids only should be put in the square, dark ones and light ones alternately. Teas and Noisettes look well outside it as shown in plan with others between them.

The drains can be either at A. A. or B. B. whichever is most convenient, and they can be covered from view by placing pots on them. The drains can be made for two annas a running foot, all that is necessary is to lay one brick flat as a foundation, and two bricks on edge and merely point them. The plants in the square should be four feet apart..

Notes on the cultivation of American Maize in the Kulu District.

By CAPTAIN J. F. POGSON.

SOME very successful experiments in the cultivation of a few of the best species of American maize have been conducted this year in the Kulu district, by the Rev. Mr. Carleton who, for some years past, has been living there. Some splendid specimens of stalks and cobs of the different descriptions of maize, and a large quantity of seed, have been sent to the Punjab Government, and district officers, and the Lieutenant-Governor, as a mark of his appreciation of the services of the Rev. Mr. Carleton, and to encourage him in his efforts to improve and increase the food-supply of the Province, has given him a grant of Rs. 500. The following particulars regarding the experiments will prove of interest. Mammoth Dent corn : a new variety, said to yield in America, under high cultivation, up to 130 bushels per acre. In Kulu, under fairly good cultivation, a crop of nearly 100 bushels per acre has been grown, and the Rev. Mr. Carleton considers that this description surpasses all that he has ever introduced. Blunt's Field corn : this variety was introduced last year, it bears from four to six cobs per stalk, and promises well. Western White corn : The Rev. Mr. Carleton introduced this variety four years ago, and it has done remarkably well, seemingly improving in this country. Longfellow's field corn : this variety comes from the extreme Northern States, especially New England, and is regarded as one of the most

prolific of all the northern varieties. It ripens very early, taking only about seventy days to grow. The crop of this class was unfortunately almost entirely destroyed by monkeys.

Mr. Carleton and I have been working independently of each other, yet we have both arrived at the same practical conclusion, *viz.*—That difference in latitude plays a most important part in the successful introduction of American Maize and Indian corn.

In the plains it is essentially necessary that the superior description of maize (American) should ripen its grain at the same time as does the indigenous inferior Indian corn.

To obtain acclimatized seed corn from imported stock, is therefore a desideratum, and I fear the difference in climate between America and Upper India is too great to admit of this result being secured. In place of seed equal to parental stock, we obtain deteriorated seed, which may or may not get worse.

In the Himalayas, (I allude to the valley of the Sutlej and include the valleys of the other Punjab rivers,) we possess altitude above the sea level, and thus by ascending or descending the slope of the mountains' side, can make good the benefits resulting from difference in latitude. For example, at Kotegurh, 6,600 feet above the sea, all kinds of American Maize will grow, and bear freely. But some kinds will not ripen seed at all, whilst others are so late in ripening that the crops must be removed to make room for the wheat and barley sowings.

To meet this difficulty, all we have to do, is to go down hill, for 530 feet or more, and then, the same maize will ripen seed, and so on by descending in this ratio, we may determine the proper altitude for ripening each variety of imported corn.

The seed so obtained is *acclimatized without deterioration*, and it stands to reason that if certain varieties of maize ripen seed in September and October, at elevations varying from 3,500 to 6,600 feet, the same seed sown in the Plains will

ripen about the same time, any how in ample time to admit of the ground being cleared for the winter crops.

I should explain that every 530 feet of ascent or descent, is connected with a change of climate, and partial change of vegetation. Thus we have Pomegranates, growing vigorously at one level, Plantains at another, and last and loyest of all Mangoes and other tropical fruits.

If Indian Agricultural products are to be improved, the Government will have to establish **SEED FARMS** in the valleys indicated, and such seed judiciously and liberally distributed to Zemindars in the Plains will in a very short time yield the improvement desired. But, if the improvements of Agriculture are to be confined to "**MODEL FARMS**" the Zemindars and Ryots will, I fear, make a point of not adopting them.

Cultivation of American Maize in the Kulu District. BY THE
REV. MR. CARLETON.

THE first question in the cultivation of maize I should refer to is the soil best adapted to its successful cultivation. One would hardly suppose that a plant of such wide geographical distribution as maize would require a particular soil for luxuriant growth. However widely distributed and grown in such a variety of soils under scientific cultivation, maize still delights in the rich warm loam or alluvial deposits in which it was grown when found an indigenous plant in North America. It is the only food producing plant that was cultivated by the savages of the country. It was almost exclusively cultivated on the exceedingly rich bottom lands or meadows along the banks of the North American rivers. The only implement used in cultivation by the Indian squaws was a stone hoe, and yet it is a well known fact that every Indian village contained large stores of old maize. This abundant supply did not so much depend upon the *mode of cultivation* as upon the exceeding richness of soil. This richness of American

bottom lands was caused by the rankest vegetation as exhibited in the dense primeval forests that covered the land ; or in other words it was the immense amount of decomposed vegetable matter brought down in the spring floods from melting snows that made up the largest part of alluvial deposits or American bottom lands. This soil, so light, warm and very rich in vegetable matter, is the land for maize and no wonder that the Indian squaws with only a stone hoe in hand could with little labor produce an abundant supply of maize for her family wants, and no wonder that the first English Colonists in their letters home to the mother country described in fabulous terms the exceeding richness of soil. It was well nigh 150 years of cultivation before signs of exhaustion of the soil caused alarm among American farmers and compelled them to look about and provide a remedy. They found a remedy by introducing thorough scientific cultivation or in other words by restoring to the soil its primitive richness giving it back in the form of every known fertilizing substance. The question now comes up with regard to maize land in India. As far as the earthy or mineral substances are concerned all have maize lands over a large part of Northern India. The alluvial soil is here formed in the same manner as the American bottom lands. But a most unhappy difference has been made by them. These soils have been under cultivation for thousands of years. Their primitive richness is well nigh gone. It is a wonder that they have not become utterly sterile. If the American bottom lands in the Northern and Eastern States showed unmistakeable signs of exhaustion in 150 years what shall we say of Indian bottom lands after thousands of years of cultivation. We will not say they have become sterile but we do not hesitate to say they are for the most part too exhausted to bear a crop of maize that would be profitable to the cultivator, and the only remedy now is the same that the American farmer adopted 40 years ago, to bring back the soil to its primitive richness. And this can be

done only by a scientific method, *i. e.*, a thorough knowledge of every substance that goes to enrich the soil; also the means and manner of applying these substances. This is what the American farmer in the olden settled portions of the United States is now doing. And the result is that fields that 40 years ago produced only from 20 to 50 bushels of maize per acre are now producing from 60 to 100. We will not attempt to hide the fact that these results are due in part to improved methods of cultivation with American farm machinery; we need not stop to compare these methods and the machinery used with the method of the Indian squaw with her stone hoe. But this one fact is most prominent that these magnificent crops of 100 bushels per acre depend not so much upon the method of cultivation as upon the condition of the soil, its richness, or capacity of production. The American Agricultural Reports on maize cultivation, especially reports on the hundreds of fields that have drawn prizes for the largest crops, do not deal so much with the kind of plough used or the distribution or planting of seed over the field as with the kinds, quality and quantity of manures applied.

It may not be out of place here if I relate to you some of my experience in maize cultivation during the last four years. It is only about four years since I purchased an old estate that belonged in old times to the Rajah of Kulu. For many generations it had been regarded as the best rice-field in Kulu. It was famous for producing a rare kind of rice used only in the Rajah's family. But like all irrigated rice lands it could produce little else. Irrigated rice lands are the most sterile of all other cultivated fields. Water passing over and percolating through the soil is a sure process of making any land sterile. There can be no high cultivation and successful farming when the land is continually flushed with water. My first work therefore was to stop rice cultivation breaking up the water courses and not permitting the water to flow into the fields. The earthy or mineral substances of the fields

differed in no respect from alluvial soil though formed in a somewhat different manner. It was formed during many generations of cultivation by a very fine sediment mostly silex coming down in the water of irrigation. The basis of the soil was all that could be desired for maize but too sterile. As an experiment to show my Christian farmers, I planted a small field of maize without manure. It had a sickly stunted growth, and the crop did not exceed the seed sown. The first work was to enrich the land and every substance available was worked into the soil. Ashes, decayed vegetable manure from the cow-shed, also sheep-dung, was purchased from our Hindoo neighbours. A field of two acres was first taken to bring under good cultivation, and now after four years we are able to produce a crop of maize as fine in luxuriance as any that may be seen in North America, yet the crop is not quite up to the highest American standard 100 bushels per acre.

KULU, 4th December 1881.

Memorandum on the artificial propagation of Tasar Cocoons.

(Communicated by W. COLDSTREAM, Esq., Deputy Commissioner, Hoshiarpore.)

THE Tasar Cocoon is met with in the wild state extensively throughout the Submontane Districts of the Punjab. As far as I have observed it is found in this part of the country only on the beri tree (*Zizyphus Jujuba*) ; but in other parts of India it is found on a considerable number of trees of different species. It is of a shape not exactly oval, but more that of a short cylinder with rounded ends from one to two inches long. It is of a dull white or yellowish colour, and of a hard and rather rough texture. This hardness is owing to the large quantity of gummy matter with which the silk is matted together in the substance of the

cocoon, and which has to be dissolved out before the threads can be wound off.

The cocoon is spun by the worms in July and September, and is most easily found in the cold weather when the people cut the leaves and branches for fodder and to form thorn hedges. By telling the villagers to look out for them they can be procured.

In the end of June and beginning of July when the beri tree, (the natural food of the worm), has a flush of fresh leaves after the first shower of rain the cocoons will begin to burst. They can be laid for the purpose of hatching in large cages of bamboo work; or on shelves in a verandah enclosed with netting. The cocoons almost always burst in the evening between 7 and 9 o'clock. Towards sunset the cocoons which are to burst that evening, though they have been for eight months hard and dry, begin to be moist at one end, and soon the moth begins to bore his head through the matted silk of his cocoon. Gradually he emerges, disengaging himself from his prison; and immediately seeks to cling to some surface with his feet uppermost so as to allow his wings now in a moist and undeveloped state to fall and expand in the proper direction. They rapidly spread out downwards and backwards and harden, and in a few hours the beautiful insect has reached its perfect state. A full sized specimen measures from five to six inches across the wings. The female is larger than the male. Her wings are of a bright yellow colour with darker bands, sometimes of a light purple or pinkish colour, and sometimes of an ashen grey, the colour of light ink stains. The male is of a light red or brick colour, sometimes pinkish. Both have round transparent *Ocelli* in their wings. The species, I find, is recognized at the British Museum as *Antheraea Siwalika*. Under Captain Hutton's classification it used to be *Antheraea Paphia*.

When the proper season has arrived during July numbers

of cocoons will burst every evening. The males appear to come out first. The moths should be kept as they are hatched in a large open work cage made of thin splints of bamboo, or in a netted verandah. They will pair the first or second night. If they are kept in a netted verandah the females will cling to the net and are likely to attract from outside wild males during the night. When the couples have separated in the morning the females should be put into small baskets or boxes separately, or with only one or two companions, to lay their eggs.

Each female will lay from 150 to 185 eggs within four or five days after she has paired. She will then die. Neither male nor female moths appear to eat anything during their short lives.

The eggs should be collected, placed in some small receptacle, such as a *duni* or small vessel made of a leaf or two leaves in which natives carry curds, &c., and this receptacle with about 100 eggs in it should be hung on to a beri tree in the open. The worms will hatch out in from seven to nine days, they are brownish and about $\frac{1}{4}$ of an inch long, but rapidly increase in size. They will crawl on to the branches of the beri and attack the succulent young leaves. The worm is a very handsome one. It is bright peagreen with silvery spots at the spiracles along each side of its body. A full grown worm is between four and five inches long and about $\frac{3}{4}$ of an inch thick. Like the Chinese silk worm it is most voracious and gets through an immense quantity of leaves.

During this time the worm has many enemies. Crows and squirrels attack it, the black ants swarm up the tree to them, and a species of hornet stings the worm and kills it in numbers. I have nevertheless had about 200 cocoons off one beri tree in the open, several little baskets of eggs such as I have described above can be hung on one full-sized beri tree. Much may be done to protect the worm while roaming over the tree, feeding. The trees selected to hang

the eggs on and eventually to form the natural feeding ground of the worms should be small and compact. It would be well if a number of trees were planted together and the whole covered by a net. Each tree on which worms are reared should be surrounded by a ring of white ashes laid on the ground close round the bush, this will prevent ants ascending the tree. The worms will spin in 25 to 30 days. The cocoons can then be gathered, moths will hatch out of these cocoons again in September. The second crop of moths is hatched five or six weeks after the first or parent crop is hatched out.

I have tried and unsuccessfully to bring up the worms by hand like ordinary silkworms, *i.e.*, by keeping them in baskets with fresh cut leaves. It does not answer, the species *will not domesticate*. This has been Captain Cousemaker's experience also in Bombay. The plan above suggested which I have myself tried with satisfactory results is a kind of semi-domestication. The worm will not thrive under cover. It seems to need the dew of heaven and the freshest of leaves. Collecting the cocoons, getting their eggs and hanging them on to selected trees out in the open as above described appears to promise the best results. I believe Captain Cousemaker has found a similar plan answer in Bombay Presidency. The plan here described was suggested to me by the late Mr. F. Halsey, but it was recommended more than 20 years ago by Sir Donald McLeod, then Financial Commissioner, in a preface to a small volume entitled "Miscellaneous papers on silk" printed at the "Lahore Chronicle" press in 1859.

It seems not improbable that following this system a kind of cottage cultivation of Tassar might be carried on by the people in such Districts as Hoshiarpur, Kangra and Gurdaspur, with most remunerative results,

Copy of a letter No. 447, dated 26th August 1876, from W. COLDSTREAM, Esq., Deputy Commissioner, Hoshiarpur, to Commissioner and Superintendent, Jullunder Division.

I INFORMED you in my No. 175 of 5th April 1876, that I had found Tasar Cocoons procurable in large numbers in this District. I resolved to try the plan of rearing the worms and getting cocoons under domestication. I was encouraged in this course by the remarks of Mr. Halsey, of Madhopur, with whom I corresponded on the subject, and who has very kindly given me much information and advice as to the rearing of the worms. I collected about 5,000 cocoons of which about 1,000 had the living chrysalis in them. This was in the month of April.

2. Very few cocoons burst till June, then the moths began to appear sparingly in the first half of the month, the rains began in earnest about the 3rd of July, and immediately after their commencement the cocoons burst in large numbers. The exit of the moth invariably took place in the evening between 7 and 9 o'clock, and the chrysalides which were about to burst were always recognisable an hour or two beforehand by their being moist at one end.

3. From the 7th to the 12th July, large numbers came out every evening.

4. Among the females I noticed three distinct varieties in colour; the bright yellow was most common, but there were a good number of a pinkish tint, and a few of an ashen gray. These varieties in colour did not extend to the male moths: which, however, varied considerably in the brilliancy of their tints. I could detect no specific difference in the moths corresponding to the variety of colours, and believe them to be all of one species (*Antheraea Paphia*). It is very probable, however, that the difference in the moth may answer to a

difference in the shade of the silk spun. The cocoons vary considerably in shades of grayish white and yellow.

5. I kept the cocoons almost entirely in the open air, some in large wicker cages in the verandah of my house, and a number I tied on to a bush in the garden, over which I spread a large garden net. Those kept in the verandah burst sooner than those on the bush.

In the first lot of moths were a large preponderance of males, and but few females: while subsequently females appeared in large numbers without a corresponding quantity of males. I am at a loss to account for this but the fact was most marked, and caused me to lose a very large number of eggs.

6. Some experimenters I see have recommended that the moths be put in pairs in small baskets to couple, this I did not find a very successful plan, I found that by leaving the moths in the large cage in which they emerged from the cocoon they paired pretty freely either the night that they emerged or the next night. It is clearly of importance that the female should pair as soon after her appearance as possible, for whether she has coupled or not she will lay most of her eggs on the 2nd or 3rd day.

7. The number of moths got so large that the cage 3 feet \times 2 feet \times 2 feet was no longer sufficiently roomy for them, so I had one end of my verandah enclosed by a garden-net on two sides, so as to form a room in which to keep the insects. In this room they paired pretty freely left quite alone to themselves.

8. The female after coupling was put into a small round basket and left in the dark to lay her eggs.

9. The first eggs were laid on the 8th or 9th of July.

10. The average number of eggs I found to be about 180.

11. The eggs hatched out in six to nine days, generally I

think on the 8th day, all the worms were hatched between the 16th July and 6th August.

12. Each batch of eggs was laid in order on a large flat basket (chubri) in the netted room, which was fitted up with stands of shelves for the purpose, and the little worms were supplied with fresh leaves of the ber tree (*Zizyphus*) twice or three times a day.

13. Having selected some ber trees conveniently situated in the tehsil compound, I sent several lots of worms and eggs unhatched to be put on these trees. The worms were simply laid on the leaves, and the unhatched eggs were hung on twigs of the tree in little leaf baskets.

14. I thus tried a double experiment of rearing the worms by bringing its food to it under cover, and by allowing it to feed at large on the tree in the open.

15. The latter system, *i. e.*, open air feeding, was much more successful than the former, rearing by hand. The worms reared in the open grew twice as fast and were evidently far more healthy. The hand reared worms grew slowly, did not attain the same size (a full grown worm is nearly six inches long) and never attained the bright translucent shade of green which characterized the worms feeding on the tree. Their skin seemed to remain opaque, though the remarkable spots of silvery lustre which the Tasar worm shews along its air holes were even brighter than those in the healthier, *i. e.*, the tree-fed worms.

16. The tree-fed worms had to be carefully watched and protected from the ravages of sparrows and other birds, ants, squirrels, &c. One small tree 12 or 15 feet high was soon devoured, and the worms had to be lifted off and put on another tree close by. Very few of the tree-fed worms fell dead on the ground, numbers perished from some cause not ascertained, probably eaten by birds and other enemies at night, they disappeared from the tree, for the number of cocoons formed did not nearly equal the number of worms

put on the tree. The trees available were too tall to permit of the worms being constantly watched from below, and it is extremely difficult to see the worm in the tree, as its colour exactly resembles the leaf.

17. In little more than three weeks after the eggs were put on the trees the cocoons began to be formed. I have gathered upwards of 200 from one tree; and as I write there are others formed and forming I believe.

The worms kept in the verandah and hand-fed gradually died away. Every morning a few were found dead in their baskets. Very few have reached the stage of making cocoons, only two have spun, and a few others may still do so.

18. My experience convinces me that it will not do to attempt to raise the worm by hand feeding.

19. On the other hand it is clear that the worm can easily be raised on the tree. My experiment on tall unmanageable trees such as I could find was successful beyond my expectations; and doubtless on trees prepared for the purpose, pollarded and their branches trained down, the worms could be better watched, and a still more successful result probably insured. Such low trees could either be netted over, or simply watched by boys, which would be quite sufficient.

20. In this semi-domesticated state I consider it probable that any number of cocoons could be produced, at no expense except that of the wages of the watchers. The bar tree grows anywhere and everywhere, and the watching could be done by women and children. Should the demand for Tasar silk, and facilities for winding and weaving it increase, the supply of cocoons is a branch of industry which might well be expected to develop in this and, other similarly situated Districts of the Punjab.

21. I got one of Jaffir's sons over from the Gurdaspur District to experiment on winding off the cocoons. He encountered the difficulty which has been fully dwelt on in the

correspondence published by the Government of India ; the difficulty, namely, of dissolving the natural cement of the cocoon sufficiently to permit of the thread running with sufficient ease. He produced a hank of silk it is true but it was very coarse and knotty.

22. Within the last few days I have received a letter from a Kasmiri, named Subhan, in Kot Naina, Gurdaspur District, enclosing a very good specimen of Tasar silk which he professes to have wound off the cocoon himself. I am making enquiries about this, and if the specimen turn out genuine will subsequently forward it to you.

CLASS III.—*Extract from the Catalogue of articles sent from Hoshiarpur to the London Exhibition 1881.*

CLASS III.—(SILK) Cocoons.

THE experimental cultivation of Tasar has been carried on here for some years. The insect is indigenous in this, as in most Sub-Himalayan Districts.

The cocoons exhibited are part of a crop reared this autumn in Hoshiarpur. The worms are semi-domesticated, i. e., the eggs are collected from the moths and hatched out in the house, and then put on the ber trees which have to be watched while the worms are feeding. They spin their cocoons in from 30 to 40 days. The cocoons collected in the winter burst in June. The moths lay. The worms hatch out in 9 days, and after 30 or 40 days feeding spin their cocoons. These cocoons are ready by end of August and September. These cocoons again burst in 21 days, and another crop of worms and cocoons is produced the insect being bivoltine, or going through all its metamorphosis twice in the year. The cocoons of the second batch which are formed in October lie dormant all the winter, and burst in the succeeding June or July, just after the first burst of the rains, when the ber tree is putting forth tender shoots,

on which the young worms thrive. The industry has not been taken up by the natives as yet, but it has been shewn that rearing the worm here is possible, though there are many difficulties to overcome, and large numbers of the worms die before coming to maturity. The natives of the District are quite ignorant, or were so till lately, of the fact that these cocoons, or *Tutis* as they call them, were Tasar silk, and none is spun or manufactured here.

A silk reeler from Gurdaspur was got over to reel off a number of the cocoons in 1877, and a piece of Tasar silk cloth was woven out of Hoshiarpur silk at Jullundur. Some of this cloth is shewn in a case along with other specimens, illustrating the natural history of the Tasar silk worm (*Antheraea Paphia*, or more recently *Sivalica*) and the process of Tasar silk manufacture.

• December 1st, 1881.

J O U R N A L
OF THE
Agricultural and Horticultural Society

OF
I N D I A

VOL. VI.

PART II.—JANUARY 1877 TO DECEMBER 1881.

CORRESPONDENCE AND SELECTIONS.

Calcutta:

T. BLACK & CO., PRINTERS, 55, BENTINCK STREET.

1882.

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Correspondence and Selections.

THE COTTON-SEED OIL INDUSTRY.

COTTON-SEED OIL is the most important manufacturing industry in New Orleans. According to the census of 1880 this industry employed in that city 1,525 hands, paid out 374,142 dols. in wages, and produce 2,742,000 dols. In a review of the trade, the New Orleans *Democrat* says the first attempt to extract oil from cotton seed was made in Natchez in 1834, but it failed. In 1852 it was tried in New Orleans, and again failed. Another attempt in 1855, when the matter was taken in hand by Messrs. Paulin Martin, F. M. Fisk, Paul Aldige and A. A. Maginnis, was crowned with success. Since that time this manufacture has steadily improved, excepting during the war, when the mills were necessarily closed. In 1867, just after the war, there were seven mills in the country; in 1870, twenty-six, and in 1880, forty-seven, six of them in New Orleans.

To-day there are forty-three cotton-seed oil mills in operation in the South, distributed as follows: Mississippi nine, Louisiana twelve, Tennessee eight, Texas eight, Arkansas four, Missouri two, Alabama two, and Georgia one, containing 2,681 box presses, of which is capable of crushing two-thirds of a ton of seed.

In the past few months two more mills have been established in Texas. A new mill is also in course of construction at Vicksburg and another will soon be established at Delta.

The cotton-seed varies from year to year in its production, depending much on the season in which it has matured. If this be favourable it is rich in oil, and readily yields thirty-five or even more gallons of oil per ton; if it be unfavourable, however, the seed becomes dry, and thirty-one gallons only is produced. The seed is injured by both heat and cold. When well stored and where it is properly ventilated it readily keeps sweet for twelve months, although some seasons, for unaccountable reasons, it fails to keep. It requires to be well ventilated to preserve it from becoming damp, and should not be stored long in bulk, as it then grows heated and is liable to spontaneous combustion. This year the seed has been worse than ever before. The heavy rains ruined and rotted it, and an immense majority of that received at New Orleans was bought as "damaged" or inferior seed. The supply, too, has been short, being 310,000 sacks behind the corresponding time last year. The consequence has been that the New Orleans mills were closed for unusually long periods this

year. The country mills, however, suffered much more severely and have worked probably only half their time.

The total amount of cotton-seed "crushed" in the United States is about 410,000 tons, or 10 per cent. of the annual product, of which the New Orleans mills last year, '79-'80, consumed 107,000 tons, or one-fourth, paying out for this over 1,000,000 dols. The supply of the New Orleans mills varies from year to year, ranging from 75,000 to 120,000 tons. The supply of cotton seed has always been less in that city than the demand, necessitating the closing of the mills several months in the year. Some years ago rival mills made an earnest effort to get a large supply of cotton seed, so as to run all the year, at the expense of the other mills. The result was a cotton-seed war, which put up the price of seed to a very high figure. The fight began in November, 1877, continuing to January, 1878, the seed getting as high as seventeen dols. a ton, a price which lost the mills a great deal of money. The mills saw the necessity of forming some organisation to prevent the recurrence of hostilities like these, and the Cotton-Seed Association was accordingly organised. This association embraces the six mills of the city. It purchases cotton-seed in the country wherever it can be obtained, from the planters, stores, etc., and divides this *pro rata* among the different mills. It also fixes and regulates the price of seed in accordance with the demand and supply. To prevent any conflict, the Memphis and New Orleans mills divide territory, agreeing not to invade each other's domains. It fixes no limit to the supply of seed it seeks, being willing to take all that is offered it.

The seed when landed at the mill is conveyed to a screen or cylindrical sifter, where it is shaken so as to allow the dust to fall from it. It is then blown against a screen, thus allowing heavy substances to fall from it. It is then conveyed to the gins, which are exactly like other cotton gins, except that the saws are set closer together, where the cotton adhering to the seed is separated from it. The seed passes thence into a revolving cylinder containing twenty-four cylindrical knives, and four back knives, which cut it up very fine. The hulls are then separated from the kernels. These hulls make very good food for cattle, selling at seven dols. a ton. The seed is then pressed between rollers, like those of a sugar mill, the oil running freely from it. It is then put in woollen bags, placed between horsehair mats, backed with leather, having a fluted surface inside to facilitate the escape of oil under the hydraulic pressure to which it is now subjected in the boxes of the press. This hydraulic pressure amounts to a pressure of 169 tons. The bags remain in the press seventeen minutes, during which time the oil is pressed out, running off into a gutter and leaving behind the dry kernels, pressed into a solid cake—the oil cake of commerce. The oil is then pumped into the oil-room, and, if it is determined to ship it as crude oil,

barrelled in this condition. If it is to be made into refined oil, it is treated with caustic soda, at the rate of about seven to fifteen per cent. of soda, the oil being kept stirred at the same time by means of paddles or an air-pump, which forces air through holes of a long iron pipe, running through the kettle. A deposit falls to the bottom and the refined oil, amounting to eighty-two per cent. of the crude oil, is drained off. The deposit is a dark substance known as soap stock. This is warmed again, so as to separate what oil remains in it, and is then sold at 1 $\frac{1}{2}$ c. a pound or used by the mill itself in the manufacture of soap, in which most of those in New Orleans are now engaged. The oil is now "refined" oil, and is carried to large tanks, where it is kept stored until ready for barrelling and shipping.

The following is the average yield of a ton of seed:—

35 gallons of crude oil at 30 cents per gallon (this yield is variable, ranging from 31 to 39 gallons) ...	...	\$10.50
22 pounds of cotton at 8 cents ...	...	1.76
750 pounds of cake, at 20 dols. per ton	...	7.20
Total yield for a ton of cotton seed	...	<u>\$19.46</u>

About 410,000 tons of seed reach the mills annually, producing for the entire South 7,772,140 dols.—about 3 per cent. of the value of the cotton crop. Of this New Orleans furnishes 2,742,000 dols.—over one-third of the entire product. The product of the cotton-seed mills are as follows:—

1. *Cotton-Seed Cake.*—This is the residue of the kernel of the cotton-seed after the oil has been pressed from it. The cake is shipped in sacks containing 200 pounds each. It is of a rich golden colour, quite dry, and has a sweet, nutty and oleaginous taste. Its principal uses are for stock feeding and fertilising purposes. It is generally ground for this purpose to the consistency of corn meal, when it becomes known as "cotton-seed meal." Most of it, used for feeding purposes, is shipped to Great Britain, where it is extensively employed in fattening stock. For this purpose it is the best food in the world, yielding a larger proportion of meat to the pound than any other animal food. It is also a good milk producer.

2. *Oil.*—There are two kinds of oil, crude and refined. The oil is used in the manufacture of soap, by painters, and for lubricating purposes. Its great use, however, is as a substitute or adulterant for olive oil, whose place it is rapidly supplying. It is nearly impossible to detect good cotton-seed oil from the best brands of olive oil by taste, smell, or any other process. This the olive growers of Italy have been unwillingly compelled to acknowledge.

The usual adulteration of the olive oil is by mixing 25 per cent. of it with 75 per cent. of cotton-seed oil, a fine table oil being the

result. Often the cotton-seed oil receives only a very small amount of some other oil to give it "a flavour." How much of the product of the cotton seed passes into olive oil and is eaten with relish and delight by the epicures it is impossible to say, but that the greater portion is so eaten is shown by the countries to which New Orleans exports this product. Of 140,840 barrels, or nearly 6,000,000 gallons, shipped during last season, 88 per cent. was exported on orders from Europe to Mediterranean and French ports, and one-half of this to Italy. This is more than the entire olive oil production of France and one-fifth that of Italy itself. As the United States reimports only one-tenth this amount of olive oil (so-called) it is evident that not only the people of this country, but the experienced epicures of Europe as well, make their salads with the products of the cotton seed. Some oil, also, goes waste where it probably figures as olive oil without the intervention of a voyage across the Atlantic; but at least two-thirds of the entire product of the country (13,000,000 gallons) is exported to Europe. It is thought that in time the prejudice now existing against cotton-seed oil will be overcome, and our people, like those of Europe, take to cooking their food in oil, as the Hebrews do, instead of using lard.

3. *Lint*.—This is the cotton scraped from the seeds. The cotton gins in the country do not have their saws sufficiently close together to take all the lint from the seed. The oil factories, by using closer saws, are able to obtain what little lint is still left adhering to it. This amounts to about twenty-two pounds a ton—that is, the first ginning, at the gins, takes off 95 per cent. of the cotton, and the second ginning, at the mill, 5 per cent. The lint is short in staple, but exceedingly white and clean, and the better grades command eight cents in the market. The "crape" cotton, which is that taken from the bolls, is worth nine cents a pound. The cotton is too good for paper stock, and is generally used in the manufacture of cotton batting. The cotton "crop" of the oil mills last year amounted to over 5,000 bales.

4. *The Hulls*.—This is the shell or skin of the cotton seed. The hull constitutes about one-half of the seed, the product of a ton of seed being 1,000 pounds of hulls and 1,000 pounds of kernel. A good use has been found for these hulls by employing them as fuel for running the mill. Some oil being still left in them, they burn well and furnish all the fuel necessary, the mills finding it unnecessary to purchase a bushel of coal. The ashes left by the hulls when burned yield a cheap and valuable fertiliser, containing the minerals needed in the production of many plants. When leached they furnish a good lye, used in the manufacture of soap.

Mr. Atkinson, of Boston, who has made himself an authority on the subject of cotton and cotton seed, is of the opinion that

the hulls of the cotton seed will furnish a good stock for the manufacture of paper, and suffice to supply all the material needed by the paper manufacturers of this country, but nothing practical has yet been done in this line.

5. *Soap Stock*.—This is the deposit left after the oil has been refined. It is manufactured into soap, and is sometimes used for making dyes.

There is a large profit in the manufacture of cotton seed in prosperous seasons, some of our companies paying as large annual dividends as 40 per cent. The chief hindrances to the business are:

Bad seed. It is almost impossible to detect this. The mills will purchase seed that appears to be good and find it inferior.

Danger from fire. This is very great, as the mills are thoroughly saturated with oil. Since the war four mills have been burned in New Orleans.

Prejudice of the farmers. There is a general feeling throughout the South that the selling of cotton seed is impoverishing the land by withdrawing an important fertiliser from it. Every effort is therefore made by the farmers to prevent the sale of cotton seed to the mills.

Sacks. These cost the companies 100,000 dols. a year.

The cost of transportation, cotton seed being a very bulky article, is very expensive freight, and is therefore mainly transported by water. The consequence is that most of the mills are situated on the river. Last year the New Orleans mills paid out about 360,000 dols. for freight alone.

The cotton seed industry is one of New Orleans' most promising industries. When the value of this product is fully recognized, the future of the cotton-seed oil industry is assured. There is scarcely any limit to it, and it will grow as the cotton industry grew when the gin was invented. The region tributary to New Orleans raises each season nearly a million tons of seed. If but half of this be consumed by the oil mills, allowing the other half for planting, wastage, &c., this will leave enough to give employment to 8,000 hands, and to turn out 12,000,000 dollars of products, to produce 25,000 bales of cotton now wholly lost, and 35,000,000 gallons of oil, enough to supply the whole world with fine vegetable table oil. The very refuse 180,000 tons of cake, will supply the region tributary to New Orleans with all the meat it wants, and the soap-stock left behind with an ample supply of soap. Such is the picture of what New Orleans might do, while for the whole South the product would be more than three times as great.

The six mills at New Orleans are as follows: Bienville, working 100 hands and with a capacity of 107 boxes. Planters', 125 hands and 210 boxes. Union, 300 hands and 182 boxes. Louisiana, 150 hands and 90 boxes. Crescent City, 150 hands and 240 boxes. Maginnis', 150 hands and 200 boxes. The Union is a Northern Company, a branch of a mill established in Providence, R. I.; Maginnis' is a private property. The other mills are all

regular stock companies. The Crescent City is now running 220 boxes, and can crush 140 to 150 tons a day. The Louisiana has a capacity of 1,500 sacks, and the planters', 150 tons of seed every twenty-four hours. The Bienville is doing equally as well as the other companies.

Mr. J. B. Gould, the United States Consul at Marseilles, reports that the imports of cotton-seed oil are growing more and more extensive at the port of Marseilles. Until the year 1868 the importation of cotton-seed oil was very small and entirely provided by English crushing factories. The extent taken at Marseilles by the soap manufacturing industry, and especially by the fabrication of white foaming soap, was the original cause of the increase in the cotton-seed oil consumption, although it was not accepted without some reluctance by soap manufacturers. Its cost, which was originally less than that of the ground-nut oil that it was to supersede, soon got to be the same, and it was found that the waste was by 2 or 3 per cent. heavier, so that the opening for cotton-seed oil as a material for the fabrication of soap is not very extensive, and it is chiefly used for an inferior quality of soap, known as "*savon blanc à froid*," the basis of which is cotton-seed oil mixed with other oils expressed from nuts, such as copal, palm, and cocoa nuts. This grade of soap is not manufactured in Marseilles, but in the neighbouring district, and especially at Avignon, and is as already stated much inferior in quality. But the cost is also less than that of the Marseilles pure soap, and thereby opens for the article a fair market in the Western parts of France. The cotton-seed oil used in soap factories chiefly comes from England, and more particularly from the crushing works at Hull.

As may be seen from the above statements, although the first attention of importers was called to the cotton-seed oil by the requirements of soap manufacturers the trade would have remained indifferent but for the remarkable perfection obtained in the preparation of cotton-seed oil in the United States. It may be asserted that the first shipments of American oil were received in this port six years ago. At that time it received little favour on account of some faults in the oil itself, and particularly in its packing, which gave great cause of complaint. American producers soon overcame this difficulty by their successive and successful efforts towards the improvement of their oil, so much so that American cotton-seed oil may now be considered as one of the most important staples of the Marseilles trade.

The fact cannot be concealed that the great favour granted to American seed oils, when properly purified, arises from the fact that they are entirely tasteless, and can be mixed with other eatable oils without offering any chance of detection other than that they congeal at a higher temperature than the pure olive oil. This inconvenience has been remedied in a measure, and samples of American oil have been received that, owing to certain pro-

cesses, keep their purity and fluidity at a temperature as low as 5° below zero Centigrade.

This improvement is not likely to be taken into much account at Marseilles, as the price of such oils is naturally higher than that of the simply purified oil, but it is expected to give an opening to American cotton-seed oil in the north, where the inconvenience above mentioned had heretofore proved an insuperable objection to its use.

As to the milder climates of this district, and especially of Italy, it has less consequence, the temperature being seldom sufficiently low to cause a detection of the mixture by the congealing of the cotton-seed oil in advance of that of the oil with which it may be mixed.

The official statements show that the most of the cotton-seed oil imported at Marseilles is re-exported in its natural state and under its own name, either by land or by sea, which would indicate that the practice of mixing cotton-seed oil with olive oil is not in great favour at Marseilles. But this should not be taken as an evidence that the olive oil exported from Marseilles is to be considered as the pure juice of the fruit; for all the so-called olive oil being first imported from Italy or the interior of France, it is not unjust to presume that the same oil that has been received as pure olive oil may be exported in the state in which it has been received, but may also have been tampered with at the places of production, and be anything but the pure oil absolutely free from any adulteration. It must be acknowledged, in justice, that a large proportion of the cotton-seed oil is used by a portion of the population in its pure state, and with the full knowledge of the consumer, who may, especially in the districts where the olive tree is not grown, prefer to make use of the article he knows to be cotton-seed oil, but pure, and which he can obtain at lower rates than the inferior article that may be sold to him at high prices as olive oil, and upon the genuineness of which he cannot rely.

At all events, the cotton-seed oil trade is, at Marseilles, in a state of progression that bids fair to increase and form a source of lively and profitable business for the American crushers. The following figures will give an idea of the advance made by the trade in the years 1879 and 1880:—

Years.	FROM THE U. S.		FROM ENGLAND.		TOTAL.	
	Barrels.	Kilos.	Barrels.	Kilos.	Barrels.	Kilos.
1880	34,622	5,564,377	18,840	4,276,696	53,462	9,841,073
1879	23,205	3,719,335	11,303	2,981,400	34,508	6,700,735
Difference.	11,417	1,845,042	7,537	1,295,296	18,954	3,140,338

The customs statistics in France only take account of the last port of shipment, and it may be assumed that a large proportion of the oil quoted as imported from England is American oil shipped from the United States to Marseilles *via* England, and transhipped at some English port.

DEVELOPMENT OF THE TRADE IN INDIAN-WOODS IN THE ENGLISH MARKET.

[As probably many of the Members of the Society do not see the *Indian Forester*, we reproduce the following remarks from a recently published Number of that periodical. The subject of Indian woods and their economic uses, has been frequently introduced in previous volumes of this Journal. So long ago as 1859. the Society awarded a prize of Rs. 500, and its gold medal to Captain W. G. Hay for the boxwood forwarded by him from the Himalaya. A further prize to the same amount was offered "to the discoverer of any wood indigenous in India and procurable in sufficient quantity, which shall serve as an efficient substitute for Turkish box, especially for wood engraving." Several kinds of wood were submitted but they were not considered up to the mark. Some interesting papers on this subject will be found in the Journal for 1861, Vol. XI. old series.]

There are some parts of India in which the forests contain more timber than there is, for many years to come, any possibility of utilizing with advantage locally. The demand in the Indian presidency towns is still limited to a few kinds of known value; and the foreign market, enterprising as many of the large firms are, still deals very little in any of the Indian woods but teak. In the quotations given in the newspapers we sometimes see mentioned the ebony, satinwood, rosewood and cedar (toon), but the supplies of these which reach the English market are chiefly from other countries than India. The rosewood sold in London or Liverpool is chiefly sent from the West Indies and Brazil, but Indian rosewood or blackwood sells sometimes very well; and we have been surprised at not hearing of any consignments being sent home for sale after the fine price, £13-10s. per ton, obtained in 1878, for specimen pieces sent to London by the Inspector-General. On the Malabar Coast we believe blackwood is plentiful, and even in parts of Northern India it may be met with of good colour and quality. Terai specimens are often met with which have a deep violet colour, and any one who travels in Orissa will be astonished to see everywhere common furniture, such as tables and chairs, made of blackwood of large size and fine markings. A recent writer in the *Timber Trades Journal* speaks of rosewood as being the second wood to mahogany. But it must not

be supposed that a price anything like £13-10s. a ton can always be obtained—everything depends on the state of the market, and the price often falls as low as £5. Even at this rate if freight is cheap, it may be profitable to ship from forest localities near the sea. On the other hand the price sometimes rises as high as £25, and £15 to £20 per ton are quite common prices for Rio and Bahia wood. Besides selling well in England good markets may be got in France at Havre and Marseilles. Of woods similar to rosewood the most valuable is probably the Burmese "yendike" of which beautiful carvings are often made, and this wood, we are sure, has only to be better known in the European market to fetch a good price. Sissoo, too, should sell well when better known. The price in Calcutta varies from about Re. 1-8 to Rs. 2 per cubic foot, while pieces sold in London in 1878 at £4-10s. a ton, and this is probably about the price that may be ordinarily expected, until its good qualities get more recognized.

Cedar wood is of several different descriptions, and is usually quoted as "Honduras," "Mexico," "Cuba," "New South Wales" and "Pencil." The last is the Pencil cedar (*Juniperus virginiana*) similar to which are our chief Juniper woods, *J. excelsa* of the North-West, and *J. recurva* of the North-East Himalaya. The American Pencil cedar is chiefly brought from Florida, and sells in small pieces of 6x6 12 inches square, at from 3s. 6d. to 4s. 6d. per cubic foot. This would scarcely be a high enough price to make it pay to send Juniper wood from the Himalayas when the heavy cost of carriage is considered. The West Indian cedar is the wood of *Cedrela odorata*, while that from Australia is *Cedrela australis*, both being nearly related to the toon trees of India which they resemble in wood. This cedar wood sells at about 4s. per cubic foot in the British market, and at this rate it might pay to send home surplus stocks from Burnia and Chittagong.

Satinwood is of two kinds, coming respectively from the East and West Indies. The former is produced by *Chloroxylon Swietenia*, a common tree of the forests of Central and South India; the latter is said to be the wood of *Maba guianensis*, an ebenaceous tree of the West Indian Islands and Guiana. The wood is often in great demand and particularly in the French market, and sells at £5 to £10 per ton.

Ebony is usually quoted of five kinds, viz., Mauritius, East Indian, African, Cocus, and Green. The East Indian ebony is chiefly sent from Ceylon and South India, the African from the Cape of Good Hope, and Green ebony is the produce of Jamaica, the wood of a leguminous tree (*Brya Ebenus*) which is not black but brownish-green. Cocus ebony is the produce of a West Indian tree which is not well known. Of these, the

Mauritius wood is esteemed the best, and is probably the produce of the same tree as the Indian ebony, *viz.*, *Diospyros Ebenum*.

The chief Indian and Ceylon ebonies are *Diospyros melanoxylon*, common in most provinces; *D. Ebenum* of South India; *D. Kurzii*, the Andamanese Marble Wood or "Teakah," and *D. gurisita*, the Calamander wood of Ceylon.

The price of ebony in England is usually about £10 to £20 per ton, equivalent at 50 cubic feet per ton to four to eight shillings a cubic foot. The difficulty about ebony is the small quantity of black heart-wood given by the common *D. melanoxylon*, and it is also probable that the sale of whatever ebony may be available will be better made at the Indian ports than in Europe. But the Andaman marble wood should sell well if sent to Europe, and more especially as it can probably be obtained of larger size than ordinary Indian kinds.

We were under the impression that the Chittagong wood (*Chikrassia*) and Trincomali wood (*Berrya*) were regularly exported, but we do not remember to have ever seen them quoted in the market lists. Ceylon jackwood we have seen quoted at £4 a ton, while cocoanut and palmyra woods fetch about the same or a little more.

Walnutwood is always in good demand, and lately has been sold at 4s. 4d. a cubic foot in London. Good burrs of course fetch higher prices.

Our remarks on the subject have been chiefly prompted by the receipt of copies of some recent correspondence between the Government of India and the Secretary of State, and between the Inspector-General and Messrs. Gardner and Sons of Liverpool, chiefly regarding boxwood, but also, to some extent, regarding possible substitutes for that wood and ornamental woods generally.

The correspondence with Messrs. Gardner and Sons is very interesting, so we reproduce it:—

Dated the 29th April 1881.

IT IS some time since we had the pleasure of communicating with you respecting boxwood.

We presume the parcels of wood now arriving from Bombay consigned for sale to Messrs. Churchill and Sim are the product of the Government forests. We brought the parcel (about 5 tons) landed Ex *Strathmore* in London from Messrs. Churchill and Sim at the high price of £30 per ton, and a parcel of 13 tons, Ex *Patna*, now landing in London, is not yet sold, but we suppose £30 is wanted. At these high prices of course the consumption will be very limited indeed.

Can you kindly inform us now what the prospects are of securing any large quantities of this wood, say 5,000 or 10,000 tons, at about £10 per ton, in Liverpool or London?

We are drawing our present supplies from Russia and Persia principally; but there are so many fiscal' restrictions, and the wood is also inferior to your Indian shipments, that we should prefer drawing all our supplies from India, and possibly our Mr. Thomas Gardner of Poti (Black Sea, Russia) might, when visiting Persia, arrange to pay you a visit also, if you can hold out any inducements to us as regards quantity.

At anything like £30 per ton only very small quantities can be used; at £10, however, it would probably be used very extensively for various purposes for which cheaper woods than boxwood are now used, and in such latter case it would be worth our while to inspect personally some of the Indian forests, and also embark a large amount of capital in this business as well as other Indian woods.

No. 155, dated the 6th July 1881.

From—THE INSPECTOR-GENERAL OF FORESTS.

IN reply to your letter of the 29th April 1881, I am very glad to learn that the boxwood sent from India has arrived, and has commanded a good price. As regards the amount of boxwood available in India, in my letters of the 15th June 1877 and the 23rd March 1876, I stated that the boxwood resources of the country are very limited. Since that time some further information has been gained, but there is nothing which modifies in any way the general conclusions stated in my previous letters, to which I beg reference.

2. There is no chance of such large supplies as those mentioned by you (from 5,000 to 10,000 tons) being available from India. Consequently, as regards boxwood, there would be no advantage to be derived from a visit to India by one of the members of your firm.

3. As regards other woods, it might ultimately be worth while to depute an agent to Calcutta and Rangoon; but in the first instance it would be well for you to examine the specimens of Indian woods exhibited at the Kew Economic Museum, and the samples which are from time to time sent home for sale to Messrs. Churchill and Sim, London. By writing to the Conservator of Forests, British Burma (Rangoon), and to the Conservator of Bengal (Darjeeling), or to the Conservator of the Central Provinces (Nagpur), or the Punjab (Lahore), these officers will be glad to send you small samples of the woods you might desire.

4. In the meanwhile I have printed this correspondence and sent it to the Conservators named, and also to the Superintendent at Port Blair (Andaman Islands), and asked them to send you samples of hard and close-grained, and light coloured woods likely to serve as substitutes for box, as well as other ornamental woods which they may desire to bring to notice.

It is very satisfactory to find that such a price as £30 per ton was realized by the N. W. P. consignment which consisted of 152 pieces measuring 195 cubic feet. In 1878 only £7 was obtained for some particularly fine specimens, and in 1880, £21 for a previous consignment from the N. W. P. Taking the ton at the usual rate of 50 cubic foot, £30 per ton would represent at present exchange about Rs. 7 a cubic foot—a

very handsome price. It seems to be supposed that good woods likely to become substitutes for boxwood would fetch £10 per ton in England. This is equivalent to about 4s. per cubic foot, and this is a price which it may well be worth while to obtain for woods which in the forests in India have little or no market value. Freight for timber may probably be estimated at from £2 to £3 per ton by the Canal, so that even if £7 only is obtained there is at least £4 to recover cost of cutting and carriage to Calcutta and to give a profit. By sailing ship freight would possibly be less, perhaps 15s. to £1 per ton only. Of possible substitutes for boxwood, *Gardenia latifolia* has already been recommended in our pages, and we expect that other species of that and neighbouring genera would yield good likely woods. *G. gymnifera* we can recommend and also *Plectranthus glidyna*. The *Cordias* would also be worth trying, while the species of *Nauclea*, and possibly *Anogeissus*, might be sent in experiment. Anjan might perhaps be considered too hard. Olive wood, we are sure, would sell well.

Homonoya symphylliæfolia of the Lower Sikkim hills could hardly be distinguished from boxwood if cut square without bark, but the most promising in our opinion is *Murraya exotica*. And besides Murraya there are other Rutaceous trees, like *Limonia acidissima* and *Atalantia*, which have the close hard grained wood so likely to prove suitable. We understand that from several provinces experimental consignments will be sent, and we hope that the sender will oblige us by informing us of the results.

In regard to ornamental woods, we have many in India, though it must be remembered that they will have a hard fight with the beautiful woods of South America and the West Indian Islands.

By far the most promising wood for which a demand is likely to arise is Padouk. The Inspector-General's logs in 1878 fetched £16-10s. per ton. This was Andaman wood, and furniture made from Padouk wood by Messrs. Jackson and Graham was very greatly admired at the Paris Exhibition.

In our opinion, the most beautiful Indian wood we have seen is *Gluta travancorica* from the Madras forests, though the Burmese Thitsi comes very near it. *Gluta* wood has a bright scarlet red colour, and is beautifully marked with lines and streaks chiefly of orange and black, and the colour seems to be permanent. Another of our most beautiful woods is the *Pistacia* of the Punjab hills, which is bright yellow with markings of brown and black; while the pinnate leaved Barberry which grows to a considerable size has an orange yellow wood, which, however, is rather apt to darken too much on exposure. The scented woods of the *Cinnamomums* deserve to be better known, as also do those of the *Cordias* so beautifully streaked and often

scented. But this attempt at enumeration had better stop, or it will be getting tedious, for there are so many more kinds that might be suggested, but we may as well at once suggest the following genera:—*Eriolæna*, *Amoora*, *Soymida*, *Mimusops*, *Pentace*, *Mesna*, *Carallia*.

BEET-ROOT v. CANE SUGAR.

THE perusal of M. Deleit's valuable paper on the sugar cane, and the advantages to be derived from careful selection, has afforded me much satisfaction. It is generally admitted by experienced planters that in many instances the sugar cane has deteriorated. This has been the result of a variety of causes, prominent among which are careless cultivation, unsuitable soil and climate, and want of care in the selection of plants. In other instances where a careful system of cultivation has been pursued and a judicious selection of plants made, the most successful results have ensued. This can be safely asserted from the results of an experience of many years in the experimental cane nursery established in connection with this department. That the establishment of experimental nurseries of this description in the whole of our sugar-producing colonies would be a source of benefit to all those engaged in this industry cannot be denied. Since the formation of this one in 1862, numerous applications for cane plants have been received, and many thousands of plants supplied; not only to the planters within the colony, but to others in Mauritius, Java, Honolulu, Figi, America, and other places, as far as the supply would admit of. They are furnished free of cost to the applicants, but there appears to be no reason why these experimental plantations should not be made self-supporting by adopting the Mauritius plan, where a small charge sufficient to cover the cost of production is made, and cheerfully paid by the planters.

At the present time we have seventy-eight varieties of sugar cane under cultivation, no additions having been made during the past year. These varieties are now very generally distributed throughout the colony, and increased observation and experience confirms me in my previously expressed opinion, that soil and climate greatly affect the quality of the juice, and materially influence both in quantity and quality the sugar produced by the plant. This is shown by the fact that a variety of cane, strong, healthy, and yielding profitable returns in one district, when removed to another within fifty miles has been known to lose many of its good qualities.

With regard to the selection of cane plants, the best developed and most vigorous plants should be chosen, as imperfect or diseased plants are not likely to produce good canes. The

age of the plants from which the cuttings are selected is not of so much importance as favourable vigorous growth and well-formed joints and eyes. In the older sugar-producing countries the cane tops, most probably in the first instance from motives of economy, have been used for plants. Some growers prefer them, considering that they produce earlier plants than cuttings from the matured portion of the cane. It is very probable that this practice of planting the immature portions of the cane has been in some measure the cause of its deterioration; but whether the most sacchariferous joints of the cane produce the most profitable plants is, I think, an open question, for it must be borne in mind that the amount of saccharine matter contained in the sugar cane does not remain the same throughout the year, at some periods the amount being hardly perceptible; but experience has not shown that cuttings taken when the cane is in this condition have produced worse plant canes than those taken when the density of the juice was at its highest. Something more than the saccharine matter contained in the cutting is necessary for the support of the young plant, for we find that upon planting a cane cutting, when the eyes shoot forth at the same time a number of roots are thrown out around the whole circle of each joint. Their uses are to supply the young plants with sustenance until they are sufficiently advanced to form their own roots. This sprouting of the eye and the simultaneous formation of roots at the joint constitute the effort made by the cane to reproduce itself. If the cutting be deprived of these roots, the young shoots will continue growing for some time, and eventually die away before they have become strong enough to form roots of their own. From this we may safely infer that something more than sugar and gluten is necessary for the nourishment of the young plant in its earlier stages.

Whether the cane plant has lost its habit of seeding from the causes mentioned in your article of August 2, 1879, or whether even it ever possessed it, is in the absence of reliable evidence purely a matter of conjecture. As far as my knowledge of the plant extends, I am disposed to think that "cane seed" has not yet been found, although in Bruce's travels he mentions "that in the East cane may be raised from seed." This statement, however, requires further confirmation, for although Porter repeats this upon Brnce's authority, subsequent investigations have not proved its existence. Numerous endeavours have been made to become possessed of it, but without success. The Royal Society of Jamaica took up the subject many years ago, and instituted a system of careful and comprehensive enquiry in order to settle this at that time doubtful point.

"The result of the enquiry was "that no variety of sugar cane was known to perfect its seed (or indeed to produce anything

like seed) either in the West Indies, China, the Straits of Malacca, Egypt, or even in the South Sea Islands, as in all these countries the cane is entirely propagated by cuttings."

Numerous methods have been tried, and many experiments made to induce the cane plant to perfect its seed, but hitherto they have proved unsuccessful. Attempts have also been made to get the flower of the Guinea corn and Indian corn to impregnate and fructify those of the cane. The experiment succeeded as far as the growth of the plants, their flowering together, and the production of the seed upon the ear of the Indian corn was concerned, but no seed appeared, and subsequent microscopic examination showed that no change had been effected as regarded the formation of the seed.

There is, therefore, no well authenticated instance of the plant having been raised from seed, and Bruce's statement most probably was a mistake, caused by his imperfect acquaintance with the language. This being the case, it would be beside our purpose to speculate upon the probability of inducing this plant to perfect fertile seeds, but rather to devote our attention to the varieties we already possess; and there can be no reasonable doubt that with judicious selection and careful cultivation very superior and fixed qualities may be obtained in the sugar cane as freely as they have been in other plants.

That "sugar cane" has, therefore rather deteriorated than improved, and it is only very recently that it has been perceived that unless some change can be introduced the cane will, by degrees, degenerate at the same time that the beet is progressively improving. The result would in time probably be the destruction of the great tropical sugar manufacturing industry," is, I venture to believe, not likely to become the case, for in this colony our sugar canes have improved through careful cultivation under suitable conditions, and this has also been the case in the Mauritius with many varieties of cane forwarded from here, as is shown by the fact that the director of the Botanic Gardens mentions in his last report that the cane garden has been discontinued in consequence of the planters being fully supplied with new varieties. Admitting, as stated, "that the cost of carriage is greatly in favour of Europe, while the beet refuse is useful for cattle-feeding, and the root enables a good system of a succession of crops to be introduced on the continent, where this sugar industry vastly increases the production of meat and corn in the districts where it is commenced, in addition to giving very profitable employment in the agricultural season;" but on the other hand it must be admitted that the element of success in beetroot cultivation, upon which so much stress has been laid in the competition between sugar cane and beetroot, is the value of the refuse material for cattle-feeding purposes. Even granting that the weight of the pulp is 18 per cent. of

that of the beet, and the yield of the pulp from an acre of land is 72 cwts., large quantities of manures of various descriptions, and some of them costly ones, and only procurable with great difficulty at a distance from manufacturing centres, and in the case of sugar-growing countries at a cost that precludes their use, are required to preserve the fertility of the land; whereas in the case of sugar cane, where the trash and megass is returned to the field and buried while in a green state, no further manuring is required. In this colony in no instance that I am aware of is the megass used for fuel, and many planters are now becoming aware of its value as a manurial agent in the preservation of the fertility of their lands, and are now using it for that purpose.

The success of the beetroot would be very problematical in this and most other sugar-growing countries, as the 45th degree of latitude in the Northern hemisphere appears to be the southern limit of its successful cultivation in reference to the extraction of sugar.

The growth of plants in any country, supposing the description of soil to be favourable, depends—1st, on the temperature; 2nd, on the amount of sunlight; 3rd, on the degree of moisture, and its presence at the time ^{when} most required by the plant. Climate is a great consideration to the growth of succulent plants, and, as a rule, an abundant supply of moisture is required; yet on soils too humid the beetroot grows large, but with much less sugar in it.

Another argument in favour of cane is its superior power of withstanding drought, which in the case of similar weather with a beet crop would result in a total loss. Our climate is as a rule too dry, and also too uncertain in the quantity of rain that falls, to allow of beet being ever generally adopted as a crop to supersede cane.

Another objection is that beetroot cannot be grown continuously upon the same land with profit, but must form one crop in a rotation. I have no data as to what the cost of working an acre of beetroot would amount to in this colony; nor has it yet been cultivated upon a sufficiently large scale to admit of even an approximate calculation. Beet cultivation was commenced and a factory established some years since in the neighbouring colony of Victoria, but operations were suspended after the second season, the results not being sufficiently satisfactory; and the company has since been dissolved. In this instance the juice did not contain as great a quantity of saccharine matter, but contained a much larger percentage of saline impurities than the juice obtained in the beet-growing districts of Europe. No claim has yet been made upon the Victorian Government for any portion of a sum of £5,000 granted for "the encouragement of the manufacture of beetroot sugar grown within

Victoria." This sum was to have been awarded at the rate of £10 per ton to the producers of fifty tons or more of beetroot-sugar.

The area in which the culture of the beet has proved a commercial success appears to be circumscribed, as its cultivation and manufacture has been unsuccessfully attempted in England, Ireland, New Jersey, California, Canada, and Victoria.

Owing to the smaller quantity of saccharine matter in beet-root than in sugar cane, and also owing to the more complex combinations in which it is found, it requires greater ingenuity and a more careful application of scientific principles in the extraction of the sugar. Putting on one side the question of profitable cultivation, this fact alone in cane sugar producing countries would in most instances prevent its cultivation, for the producer would have to erect all the complicated and expensive apparatus of a beetroot sugar refinery, in addition to that required for the extraction of the juice, and then to work the plant only during crop time—say for 100 days—and attempt to compete with European sugar refineries, which would be to enter upon a severe and unnatural competition which no probable yield would justify.

In fact the planter instead of an ordinary cane sugar producing plant will have established a sugar refinery, which working only quarter time will be so heavily weighted that it must be hopelessly beaten in the race, and the profits from beet culture, if any, will be absorbed by the loss in refining. But in addition to this, a larger amount of both scientific and practical knowledge is necessary. The beetroot manufacturer must not only be a thorough practical agriculturist, but he must also be a good chemist, and familiar with mechanics and engineering, in order to carry out improvements suggested by experience, thus keep pace with the progress of other manufacturers.

He therefore may not be far dist at wh^e cane agriculture and manufacture will be conducted on more advanced principles than are usually applied at present; it is possible that the cheapness with which sugar can be made from cane will lead to the extension of its growth to such a degree that the price of sugar will fall to a point at which beetroot sugar manufacture ceases to be profitable.

From a careful consideration of the subject, I think we may safely arrive at the conclusion that in cane-producing countries the sugar cane is not likely to be supplanted by the beetroot; and in cases where the cane plant has degenerated we must devote our attention to the discovery of the cause and its remedy, and not to the introduction of other sugar-producing plants.

That the degeneration of the cane plant does not proceed solely from the use of immature cuttings we may infer from the fact that good results have been obtained from diseased canes

when transferred to new country. From this we may reasonably infer that the exhaustion of the soil may have something to do in the matter. This exhaustion of the soil is the result of defective cultivation and insufficient manuring, and it is upon improved methods of culture and careful selection of plants more than upon new varieties of cane that the planter must mainly rely upon; at the same time there is no question but that the introduction of new varieties of cane, and the adaptation of species to soil and climate, are important points in the general improvement of cane agriculture.

This article may well be concluded with the words of a West Indian planter of many years' experience:—"Modern improvements in agriculture have doubtless raised the yield of beetroot crops, and may do it still further; but in a similar degree is the agriculture of sugar plantations capable of further important improvements, and the yield of cane capable of being considerably increased. So far as the production of sugar is concerned, the advantage is so greatly and obviously on the side of the sugar cane that the decision against beetroot cultivation is arrived at as an *à priori* judgment, which has hitherto been held with considerable tenacity by the majority of the agriculturists in this country."—*Walter Hill, Director of the Botanic Garden, Brisbane, Queensland.*

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	Lyall,† R. A., Esq., Merchant, Calcutta	...	1875
	Lynam,* John, Esq., Supdt., Reserve Police Force	...	1866
	Lynch, Dr. Sydney, Calcutta	...	1872
	M.	...	
270	MACALLISTER,* R., Esq., Merchant	...	1872
	Mackenzie, A. F., Esq., Opium Dept., Cawnpore	...	1881
	Mackenzie, W. S., Esq., Jutwanpore, Somastipore, Tirhoot	...	1879
	Mackenzie, W., Esq., Itmasnuggur, Somastipore, Tirhoot	...	1880
	Mackillican, J., Esq., Merchant, Calcutta	...	1865
275	Mackinnon, D., Esq., Merchant, Calcutta	...	1874
	Mackinnon, John, Esq., Merchant, Calcutta	...	1875
	Mackintosh, A., Esq., Dooria Factory, Tirhoot	...	1879
	MacLachlan, J. E., Esq., Merchant, Calcutta	...	1861
	MacNab, W., Esq., Tea Planter, Hatibanda, Now- gong, Assam	...	1881
280	Macnamara, J. A., Esq., c. e., Dist. Engineer, Sha- habad	...	1877
	Macpherson, W., Esq., Civil Service, Calcutta	...	1861
	Madge, H. J., Esq., Govt. Surveyor of Steam Boilers, Calcutta	...	1881
	Mahabeer Persad Rae, Bahadoor, Baboo, Chuprah	...	1882
	Maharajah of Betteah, Tirhoot	...	1870
285	Maharajah of Cooch Behar	...	1864
	Maharajah (Coomar) of Vizianagram	...	1879
	Manager, Amluckee Tea Company, Assam	...	1877
	Manager, Awah Estate, Awahgurh, Agra District	...	1879
	Manager, Balasun Tea Co., Darjeeling	...	1875
290	Manager, Bengal Tea Company, Cachar	...	1867
	Manager, Bishnath Tea Co., Assam	...	1875
	Manager, Blackburne Tea Garden, Assam	...	1881
	Manager, Boreilli Tea Company, Assam	...	1878
	Manager, Brahmapootra Tea Co., Assam	...	1875
295	Manager, Boromcherra Tea Garden, Cachar	...	1876
	Manager, Central Cachar Tea Co.	...	1875

M.—(Continued.)

	<i>Admitted.</i>
Manager, Central Terai Tea Co., Darjeeling	... 1875
Manager, Chenga Tea Association, Darjeeling	... 1875
Manager, Chumta Tea Association, Darjeeling	... 1875
300 Manager, Chunderpore Tea Garden, Assam	... 1875
Manager, Chundypore Tea Company, Cachar	... 1862
Manager, Cutlee Cherra Garden, Cachar	... 1865
Manager, Dahingapore Factory, Assam	... 1865
Manager, Darjeeling Tea and Cinchona Association, Darjeeling ...	... 1879
305 Manager, Debrooghur Divn., Upper Assam Tea Co., Assam ...	... 1881
Manager, Durrung Tea Company, Assam	... 1877
Manager, Dewkonall Estate, Cuttack	... 1871
Manager, East India Tea Company, Assam	... 1865
Manager, East India Tea Company, Cachar	... 1866
310 Manager, Equitable Coal Company, Ld., Seetaram- pore ...	... 1882
Manager, Gellahutting Tea Estate, Assam	... 1877
Manager, Giell Tea Co., Darjeeling ...	... 1873
Manager, Goomrah Factory, Tirhoot ...	... 1865
Manager, Government Garden, Fyzabad, Oudh	... 1871
315 Manager, Government Garden, Gondah, Oudh	... 1875
Manager, Greenwood Tea Garden, Assam	... 1875
Manager, Halmara Tea Estate, Assam ...	... 1870
Manager, Hoolmeree Tea Co., Assam ...	... 1875
Manager, Julnacherra Tea Garden, Cachar	... 1875
320 Manager, Kaliabar Tea Estate, Assam ...	... 1876
Manager, Kallacherra Tea Company, Cachar	... 1862
Manager, Kalline Tea Garden, Cachar ...	... 1874
Manager, Kamptee Gwallie Tea Estate, Debrooghur	... 1875
Manager, Kanchunpore Tea Company, Cachar	... 1862
325 Manager, Kassomaree Tea Garden, Assam	... 1875
Manager, Kobira Tea Estate, Mungledye, Assam	... 1877
Manager, Koeyah Factory, Cachar ...	... 1865
Manager, Koombar Tea Estate, Cachar...	... 1882
Manager, Koomtai Tea Garden, Assam...	... 1869
330 Manager, Lalla Mookh Tea Garden, Cachar	... 1875
Manager, Lallacherra Garden, Cachar ...	... 1879
Manager, Luckimpore Tea Co., Assam ...	... 1875
Manager, Luckwah Tea Garden, Assam	... 1875
Manager, Majagram Tea Co., Cachar ...	... 1875
335 Manager, Majulighur Tea Estate, Assam	... 1875
Manager, Meleng Tea Estate, Assam ...	... 1881
Manager, Monacherra Tea Garden, Cachar	... 1875
Manager, Moran Tea Co., Seesaugor, Assam	... 1875

M.—(Continued.)

		<i>Admitted.</i>
	Manager, Margaret Hope Tea Plantation, Darjeeling	1876
340	Manager, Masempore Tea Garden, Cachar	1875
	Manager, Mettegurrah Tea Concern, Darjeeling	1877
	Manager, Mesia Jan Tea Estate, Debrooghur	1875
	Manager, Munguldye Tea Co., Assam	1875
	Manager, Muttuk Tea Co., Assam	1878
345	Manager, Narainpore Garden, Cachar	1865
	Manager, New Golaghat Assam Tea Co., Assam	1881
	Manager, Noakacherra Tea Company, Assam	1865
	Manager, Nonai Tea Company, Assam	1882
	Manager, Noobaree Tea Estate, Assam	1878
350	Manager, Nuddea Ward's Estate, Kishnaghur	1875
	Manager, Otter Indigo Concern, Tirhoot	1882
	Manager, Pattareah Tea Co., Sylhet	1875
	Manager, Phoenix Tea Co., Cachar	1878
	Manager, Piakpara Estate, Piakpara, near Calcutta	1879
355	Manager, Punkabaree Tea Co., Punkabaree	1878
	Manager, Rajmai Tea Estate, Assam	1881
	Manager, Rampore Tea Garden, Cachar	1880
	Manager, Rookenee Tea Garden, Cachar	1882
	Manager, Roopacherra Tea Garden, Cachar	1875
360	Manager, Rungting Tea Co., Darjeeling	1881
	Manager, Scottish Assam Tea Co., Assam	1875
	Manager, Silcoorie Tea Garden, Cachar	1875
	Manager, Singtoom Tea Garden, Darjeeling	1880
	Manager, Singbulli and Nurmah Tea Co., Ltd., Darjeeling	1875
365	Manager, Singell Tea Company, Darjeeling	1874
	Manager, Sissobari Garden, Julpigoree	1877
	Manager, Sonai Tea Co., Cachar	1877
	Manager, Springside Tea Garden, Kurseong	1875
	Manager, Sungma Tea Association, Ld., Darjeeling	1882
370	Manager, Tarabarie Tea Estate, Darjeeling Terae, Silligoree	1882
	Manager, Tarrapore Tea Co., Burtoll Div., Cachar	1880
	Manager, Tarrapore Tea Co., Dewan Divn., Cachar	1882
	Manager, Tarrapore Tea Co., Labac Divn., Cachar	1882
	Manager, Tarrapore Tea Co., LaMong Div., Cachar	1865
375	Manager, Tarrapore Tea Co., Tarrapore Div., Cachar	1871
	Manager, Tarrapore Tea Co., Thaalu Divn., Cachar	1882
	Manager, Teendarea Tea Company, Darjeeling	1874
	Manager, Teesta Valley Tea Association, Darjeeling	1875
	Manager, Terihannah Tea Plantation, Darjeeling	1876
380	Manager, Tukvar Tea Co., Darjeeling	1878
	Manager, Woodlands, Cachar	1882

M.—(Continued.)

	<i>Admitted.</i>
Manook, Dr. S. J., Civil Surgeon, Chyebassa	... 1866
Martin,* John, Esq. ...	... 1874
Martin, W., Esq., Indigo Planter, Minpuri	... 1881
385 Masters, C. C., Esq., Barrister-at-Law, Bankipore	... 1878
McCaw, W. J., Esq., Merchant, Calcutta	... 1882
McFarlane, A. C., Esq., Merchant, Calcutta	... 1870
McIntosh, A. R., Esq., Merchant, Calcutta	... 1872
McWilliam,* O. G. R., Esq., c. s. ...	... 1881
390 Meugens,† J. G., Esq., Merchant, Calcutta	... 1865
Mewburn,* G. F., Esq., Merchant ...	... 1874
Meyer,* H., Esq., Kootahi Factory, <i>vid</i> Baraitch, Goruckpore ...	... 1879
Middleton, J. A., Esq., Tingking Factory, Sissa P. O., Assam. ...	... 1882
Minchin, F. J. V., Esq., Aska, Ganjam ...	... 1862
395 Mitchell,* R. W. S., Esq., Emigration Agent for Trinidad ...	... 1875
Mohendrolall Khan, Koomar, Narajole, Midnapore	... 1871
Mohes Chundra Biswas, Baboo, Jummoo, <i>vid</i> Seal- kote ...	... 1882
Mohis Chunder Chowdry, Baboo, Pleader, High Court, Calcutta ...	... 1880
Moore, C. H., Esq. Merchant, Calcutta ...	... 1881
400 Morison, Harry, Esq., Managing Proprietor, Kolea- panie Tea Estate, Jorehaut, Assam ...	... 1880
Morris, E., Esq., Manager, Hong-Kong and Shanghai Banking Corporation, Calcutta ...	... 1874
Mullen, Dr. T. French, Residency Asst. Surgeon, Ulwar, Rajpootana ...	... 1871
Munro, Mrs. E., Calcutta ...	... 1882
Murray, J. C., Esq., Calcutta ...	... 1879

N.

405 NARAYAN RAO, Maharajah of Dewass, Indore	... 1874
Nassiruddeen Ahmed, Moulvi, Behar ...	... 1876
Narendra Narain Roy, Baboo, Jemooah, Khandi, Moorshedabad ...	... 1879
Narsing Row, Zemindar, Vizagapatam ...	... 1879
Nawab of Jaora, H. H. the, Jaora ...	... 1882
410 Newson, W. H., Esq., Merchant, Calcutta	... 1876
Nickels, C., Esq., Indigo Planter, Pussewa Factory, Jounpore ...	... 1866
Nobin Chand Bural, Baboo, Solicitor, Calcutta	... 1874
Nolan, Phillip, Esq., Civil Service, Arrah	... 1873
Noor Khan, Huzrut, Minister of Jowrah	... 1871

N.—(Continued.)

Admitted.

415	Norman, Godwin, Esq., Broker, Calcutta North, W. M., Esq., Bogracote Tea Estate, Silligoree Nottobur Sing, Rajah, Chowdry-bazar, Cuttack	...	1882 1879 1879
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O.

OBHOYCHURN GOHO	Baboo, Merchant, Calcutta	...	1856
O'Brien, Dr. D.	Beheating Tea Co., Debrooghur, Assam	...	1881
420 Odling, C. W., Esq., c. s., Arrah	...	...	1871
O'Keefe, J. W., Esq., Merchant, Calcutta	...	1871	
Opendra Chundra Sing, Baboo, Bhangulpore	...	1882	
Orr,* Major Alexander P.	...	...	1868
Osborne,* Lt.-Col. J. H. Willoughby	...	...	1870

P.

425	PALMER, W., Esq., Examiner, Telegraph Department, Calcutta	...	1881
	Pandè, T. C., Rajah of Pakour	...	1881
	Parcell, W. G., Esq., Debing Tea Co., Assam	...	1877
	Paterson, James, Esq., Merchant, Calcutta	...	1881
	Peppé, W., Esq., Birdpore, Gorruckpore	...	1875
430	Perkins,* Dr. R. H.	...	1880
	Pertab Narain Singh, Baboo, Depy. Magistrate, Bancoorah	...	1882
	Phillips,* J., Esq., Manager, Government Farm, Al- lahabad	...	1875
	Piggot, William, Esq., Broker, Calcutta	...	1864
	Pillans, C. H., Esq., Tea Planter, Phoolbaree, Silli- goree	...	1880
435	Pirie, A. H., Esq., Canning College, Lucknow	...	1879
	Pitcher, Major D. G., Cawnpore	...	1882
	Playfair,* P., Esq., Merchant	...	1882
	Plowden, W. C., Esq., c. s., Simla	...	1881
	Political Agent for Supdt., Rajkumar College, Bun- dekkund	...	1876
440	Pope, C. H., Esq., Ackrigunge, <i>via</i> Nulhatti	...	1882
	Pope,* E., Esq.	...	1881
	Porter, G. E., Esq., c. s., Judge, Gya	...	1880
	Prannath Pundit, Baboo, Bhowanipore	...	1877
	Pratapa Chundra Ghosa, Baboo, Calcutta	...	1869
445	Pratt, H., Esq., Calcutta	...	1880
	Pratt, W. D., Esq., Dist. Supdt. of Police, Midna- pore	...	1881
	Preo Nauth Sett, Baboo, Calcutta	...	1876
	Prosonno Coomar Banerjee, Baboo, Calcutta	...	1871

P.—(Continued.)

Admitted.

Protheroe, Major M., Supdt. of the Andamans, Port Blair	...	...	...	...	1881
450 Purnanund Borooah, Baboo, Extra Assistant Commissioner, Debrooghur	...	...	...	...	1880
Pyne, R., Esq., Purneah	...	...	...	...	1867
Q.					
Quinton, J. W., Esq., Civil Service, Allahabad	...	...	...	1861	
R.					
RAJAH OF Boop, Cuttack	...	...	...	...	1881
Rajendro Narayan Roy, Rajah, Joydebpore, <i>vid</i> Dacca	...	...	...	...	1880
455 Ram Chunder Chatterjee, Baboo, Kalliene Cheera Tea Estate, Cachar	...	...	...	...	1882
Ramanymohun Chowdry, Rai Bahadoor, Zemindar, Rungpore	...	...	...	...	1861
Ram Narain Chatterjee, Baboo, Calcutta	...	...	...	...	1881
Ramessur Maliah, Baboo, Howrah	...	...	...	...	1882
Rampini, R. F., Esq., c. s., Dacca	...	...	...	...	1875
460 Rao of Cutch, H. H. the, Bhuj	...	...	...	...	1882
Ramsay, Herbert, Esq., Tea Planter, Kurseong	...	...	...	...	1878
Ravenshaw,* T. E., Esq., Civil Servico	...	...	...	...	1865
Rayson, J., Esq., Manager, Bangpara Tea Garden, Debrooghur	...	...	...	...	1877
Reilly, Herbert, Esq., Depy. Magistrate, Maldah	...	...	...	...	1872
465 Riach, T. S. M., Esq., Manager, Kinikor Tea Estate, Assam	...	...	...	...	1882
Ritchie, D. W., Esq., Offg. District Supdt. of Police, Noakhally	...	...	...	...	1871
Robinson,* S. H., Esq., Merchant	...	...	...	...	1854
Romesh Chunder Mittra, the Hon'ble, Calcutta	...	...	...	...	1874
Rose, R., Esq., Depy. Post Master General of Oudh, Lucknow	...	...	...	...	1877
470 Rowett, R., Esq., Merchant, Rangoon	...	...	...	...	1877
Ruddock, Dr. J. B., Medical Officer, Messa, Kellyden, Assam	...	...	...	...	1882
Ruddock, E. H., Esq., b. c. s., Rampore Beauleah	...	...	...	...	1868
Runglall Sing, Baboo, Bhaugulpore	...	...	...	...	1876
Rushton, H. P., Esq., Merchant, Calcutta	...	...	...	...	1879
S.					
475 SAGORE DUTT, Baboo, Merchant, Calcutta	...	...	...	...	1855
Samachurn Law, Baboo, Merchant, Calcutta	...	...	...	...	1850
Samanand De, Bahadoor, Rai, Balasore	...	...	...	...	1875
Sceales, Jaffray O'Brien, Esq., Bancoorah	...	...	...	...	1869

S.—(Continued.)

		<i>Admitted.</i>
	Schiller, F., Esq., Broker, Calcutta ...	1881
480	Scotland, J. P., Esq., Ex. Engineer, Buxar ...	1882
	Secretary, Assam Company, Calentta ...	1865
	Secretary, Cantonment Public Garden, Agra ...	1865
	Secretary, Cantonment Fund Committee, Morar ...	1878
	Secretary, Local Funds, Raepore ...	1874
485	Secretary, Local Fund Committee, Ferozepore ...	1861
	Secretary, Local Fund, Nimar, Khundwa ...	1873
	Secretary, Municipal Committee, Mirzapore ...	1869
	Secretary, Municipal Committee, Prome ...	1876
	Secretary, Municipality of Mau, Ranipore, Jhansi ...	1878
490	Secretary, Patna Municipality, Patna ...	1880
	Secretary, Public Garden, Azimghur ...	1871
	Secretary, Public Garden, Benares ...	1875
	Secretary, Public Garden, Bhaugulpore ...	1881
	Secretary, Public Garden, Monghyr ...	1882
495	Secretary, Public Garden, Nowgong, Bundelkund ...	1877
	Shamlal Sen, Baboo, Gourceapore ...	1881
	Shaw, S. H., Esq., Tea Planter, Moheena, Golaghat	1882
	Sherlock, J. E., Esq., Calcutta ...	1878
	Sherman, J. M., Esq., Senior Master Pilot, Calcutta	1882
500	Sherriff, W., Esq., Jorroda, Jessore ...	1859
	Shillingford, G. W., Esq., Bogracote, Pillan's Hat, via Siligoree ...	1882
	Shircore, A. A., Esq., Barrister-at-Law, Kussowlie, Punjab ...	1881
	Shiwaja Rayo, H. H., the 1st Prince of Indore, Holkar ...	1881
	Showers,* St. Geo. A., Esq. ...	1875
505	Shuttleworth, E. J., Esq., Bankipore ...	1882
	Simson,* James, Esq., Civil Service ...	1856
	Skinner, A., Esq., Mussoorie ...	1854
	Sladen, J. Esq., c. s., Meerut ...	1876
	Smallwood, A. E., Esq., Broker, Calcutta ...	1875
510	Smart, J. F., Esq., Manager, Balagan Factory, Noa- kacherra, Assam ...	1880
	Smith,* Maxwell, Esq. ...	1881
	Spark, H. J., Esq., c. s., Rai Bareilly ...	1876
	Spencer, Harrison, Esq., Tea Planter, Darjeeling ...	1874
	Sprenger, A., Esq., Ex. Engr., Upper Assam Divn., Debrooghur ...	1880
515	Sri Mohun Thakur, Baboo, Berarie, Bhangulpore ...	1877
	Stalkartt, William, Esq., Merchant, Calcutta ...	1845
	Stalkartt, J., Esq., Hope Town, Darjeeling ...	1863
	Steel, Octavius, Esq., Merchant, Calcutta ...	1874

S.—(Continued.)

Admitted.

Steel, Donald, Esq., Eastern Cachar Tea Company, Cachar	...	...	...	1861
520 Stevens, C. C., Esq., Civil Service, Calcutta	...	...	1875	
Stevens, H. W., Esq., Supdg. Engr., Durbhangā	...	...	1867	
Stevenson,* Geo., Esq., Civil Service	...	...	1873	
Stewart, R. D., Esq., Julpigoree	...	...	1878	
Stokes,* Allen, Esq.	...	...	1867	
525 Stokoe, T. R., Esq., Barrister, Calcutta	...	...	1878	
Strachan, James, Esq., Kurrachee	...	...	1880	
Stratton,* J. P., Esq.	...	...	1873	
Studd,* E. J. C., Esq.	...	...	1875	
Sturmer, A. J., Esq., Talooka Rajah, Cheriakote, P. O. Zumanea	...	...	1866	
530 Sukiaram Martund, Esq., Indore	...	...	1872	
Sumbhoo Narayana, Rajah Bahadoor, Benares	...	...	1872	
Superintendent, Chumba Estate, Chumba <i>via</i> Dal- housie	...	...	1881	
Superintendent, Rambagh, Umritsur	...	...	1859	
Superintendent, Taj Garden, Agra	...	...	1874	
535 Superintendent, Central Prison, Benares	...	...	1871	
Superintendent, Serajgunge Jute Company, Seraj- gunge	...	...	1868	
Superintendent, Botanical Garden, Saharunpore	...	...	1878	
Superintendent, Government Horticultural Garden, Lucknow	...	...	1879	
Surdharee Lal, Baboo, Zemindar, Bhaugulpore	...	...	1874	
540 Sutherland, Charles J., Esq., Merchant, Calcutta	...	...	1888	
Sutherland, A. B., Esq., Merchant, Calcutta	...	...	1870	
Syed Wilayat Ali Khan, Patna	...	...	1876	

T.

TAYLOR, S. H. C., Esq., c. s., Beerbhoom	...	1873
Terveen, W., Esq., Calcutta	...	1877
545 Thomas, G., Esq., Merchant, Calcutta	...	1882
Thomas, G., Esq., Zemindar, Monghyr...	...	1875
Thomas, J., Esq., Merchant, Calcutta	...	1867
Thompson, H., Esq., Joyhing Tea Estate, North Luckimpore, Assam	...	1881
Thompson, H. E., Esq., Supdt., Govt. Telegraphs, Akyab	...	1879
550 Thompson, Hon'ble Rivers, Lieut.-Governor of Ben- gal, Alipore	...	1882
Thompson, Lt.-Col. W. B., Depy. Commr. Dumoh, C. P.	...	1879
Thornhill, E. B., Esq., Civil Service, Aligurh	...	1875

I.—(Continued.)

Admitted.

Toomey, Geo., Esq., Indigo Plauter, Contai, Tirhoot	1870
Tottenham,* the Hon'ble L. R., Civil Service	1873
555 Tresham, W. C., Esq., Baylah Indigo Concern, Benaros	1879
Tucker, Robert, Esq., Tea Planter, Seebsaugor	1867
Turner, H. G., Esq., M. c. s., Waltair	1881
Twiss, Col. A. W., R. A., Commanding at Morar	1881
Tyler, F. W., Esq., Supdt., Railway Mail Service, Allahabad	1881
J.	
560 UMBER JUNG Bahadoor, Rana, Lieut.-General, Kat- mandoo, Nepal	1881
V.	
Voss,* C. W., Esq., Merchant	1864
W.	
WALKER, William, Esq., Tea Planter, Seebsaugor, Upper Assam	1870
Wallace, Adolphus, Esq., Rungajaun Factory, Golag- ghat, Assam	1866
565 Wallace, G. Esq., Doria Factory, Golaghaut, Assam	1875
Wallace,* Capt. W.A. J., R. E.	1880
Wallich, C. A. N., Esq., Tea Planter, Julpigoree	1881
Walters, C. Esq., N. B. S. Ry., Saidpore	1882
Walton, T., Esq., Julpigoree	1878
Warburton, Major, Political Officer, Khiber	1882
570 Ward, W. E., Esq., Civil Service, Gowhatti	1873
Ward, G. E., Esq., c. s., Jounpore	1878
Way, Lt.-Col. G. A., Depy. Asst. Adj't. Genl., Shillong	1879
Webster, R., Esq., Subornakhally	1879
Weingartner, J. E., Esq., Locq.-Dept., Saidpore	1881
575 West, R. Barton, Esq., Calcutta	1876
White,* Philips, Esq.	1880
Whitney, F., Esq., Merchant, Calcutta	1875
Whitty, Irwin J., Esq., Civil Engineer, Mozufferpore	1867
Whyte, Alex., Esq., Raneegunge	1881
580 William, the Revd. Albert, Serampore	1881
Williamson, R., Esq., Calcutta	1881
Wilkinson, Capt. C. J., Supdt. P. & O. Company, Calcutta	1878
Williamson,* Capt. W. J., Inspector-Genl. of Police	1867
Wilson, H. F., Esq., Naraingunge	1870
585 Wilson,* A., Esq., Merchant	1879
Wintle, Lt.-Col. H. R., Commanding at Futtehgurh	1880

W.—(Continued.)

Admitted.

Wood, E. P., Esq., Barrister-at-Law, Calcutta	...	1879
Wood, F., Esq., Hattowrie Facyt., <i>viā</i> Bilaspore, T. S. Railway	...	1882
Woodman, J. V., Esq., Barrister-at-Law, Calcutta	...	1875
590 Wood-Mason, J., Esq., Asst. Curator, India Museum, Calcutta	...	1877
Worsley, C. F., Esq., c. s., Mozafferpore, Tirhoot	...	1879
Wyatt,* A. W. N., Esq.	...	1878
Wright, W., Esq., Judge, Small Cause Court, Cuttack	...	1866
Y.		
YULE, Geo. Udney, Esq., Merchant, Calcutta	...	1879
Z.		
595 ZORKE, Dr. J. M., Civil Surgeon, Balasore	...	1882

JOURNAL
OF THE
Agricultural and Horticultural Society
OF
INDIA.

Report on machine and hand-made paper submitted at the Calcutta Exhibition of Indian Art Manufactures, 1881-82.

(THE question of various Indian products suitable as materials for paper manufacture has engaged the attention of the Society at various periods almost from the formation of the Institution to the present time.* A valuable and interesting report on this subject was drawn up by the jurors (Messrs. W. H. Cogswell and G. W. Stretton) on Class "II (paper) of the recent Exhibition of Indian Arts and Manufactures. So valuable indeed was it considered that besides being introduced in the body of the general report it was printed as an appendix thereto. Through the kindness of the jurors this paper has been placed at our disposal. As the *Calcutta Gazette* in which it originally appeared has most probably not been seen by the majority of the members, it has been deemed desirable to reproduce it, with the Government Resolution thereon, in the pages of the Journal, not only for general

* See papers by the Rev. Dr. Carey, Founder of the Society, and Dewan Ramcomul Sen, V. P., "on the manufacture of paper used by the natives, written in 1832, and published in Vol. 2, of the Transactions."

information, but by way of record, as the important subject on which it treats will doubtless be continually brought to the notice of the many who are interested in the production of cheap Indian materials for paper manufacture.]

Extract from the Resolution of the Government of Bengal,
22nd April 1882.

An interesting and valuable report has been submitted by the jurors on Class VII (paper) which, as it extends to some length, is printed as an appendix to this Resolution. The question of improving the Indian manufacture of paper, and of finding a market in England for the various Indian products capable of being used as material for paper manufacture, is one of great importance, and the remarks and suggestions of the jurors upon the subject deserve careful attention.

The only specimens of machine-made papers come from the Bally Mills, which contributed papers of plantain, aloe, moonj, mahalyne, and jute fibre. The same mills contributed also specimens of blotting paper, cartridge paper, and brown paper, all of which are commended by the jurors. The jurors draw special attention to the fact that in no instance does an excess of clay appear to have been employed in the manufacture of the paper exhibited by the Bally Mills Company, to whom they have awarded a gold medal and a certificate of honourable mention. Of the native hand-made papers exhibited, with one exception, the Committee do not speak favourably. The writing papers are coarse and wanting in colour and surface, and the blotting paper is far too absorbent. The exception alluded to is one of Bhutea paper from Darjeeling, which is praised both for its quality and toughness. The attention of the Commissioner of the Rajshahye and Cooch Behar Division will be invited to this subject, on which he will be asked to submit a report to Government.

APPENDIX TO THE FOREGOING RESOLUTION.

Class VII.—PAPER.

WE the undersigned have the honour to submit a report on the samples of machine-made paper and hand-made paper exhibited in the foregoing class.

2. As this branch of industry is of paramount importance to the producer and the consumer, and is one that is at the present time absorbing the earnest thought and attention of different Governments and the commercial world, we desire to be lucid in our remarks and minute in our reasons for the awards recommended. Further, we propose to go a little beyond our legitimate duty, and append to our report a few suggestions that may ultimately tend to further the development of this manufacture.

3. In adjudicating on the different descriptions of machine-made paper exhibited, we will deal with them in the order they have been catalogued.

PLANTAIN.

4. Plantain fibre for textile and cordage purposes seems to have been in use for many years past. The celebrated circumnavigator, Dampier, describes the process of preparing this fibre in the Indian Archipelago more than a century ago, and P. L. Simmonds, F. R. C. S., in his Essay on Fibres and Cordage of recent date, refers to the different uses to which plantain fibre is put, amongst which he enumerates light fabrics, damasks, and the finer sorts of furniture hangings and upholstery generally.

5. Nowhere, however, do we remember reading of the plantain fibre having hitherto been used for paper-making. The BALLY MILL COMPANY therefore are justly entitled to be called the originators of paper manufactured from it.

6. The nine samples of paper before us have been made

1. Borneo variety.
2. Andaman variety.
3. Variety, indigenous to lower Bengal.

Through an oversight this latter variety, though represented, has not been noted in the catalogue.

from the three varieties of plantain fibre noted in the margin.

7. The fact that no blend has been used is sufficient proof that this fibre will run on the machine, and produce a thin, strong, serviceable paper, which is more than the ordinary grasses will do, unless mixed with some stronger fibre. The

samples show that the fibre is capable of being effectually sized and dyed, and that the paper does not crack when folded. Their relative strength, quality, and texture are to a great extent uniform. Disintegration appears complete as there is no appearance of undigested fibre either in the form of long filaments or knots—commonly known as “sago” in the trade—a most unfortunate transformation if it takes place in the machine chest. The surface of the papers bears signs of cockling on the machine, but this drawback may be obviated, no doubt, by using a blend of some other softer and more elastic material. The colour is also against the paper; but this imperfection may likewise be remedied in all probability by another treatment which can only be arrived at by a series of experiments.

8. The following is a summary of the advantages plantain fibre offers for paper-making :—

- (a.) Unlimited supply.
- (b.) Uniformity of fibre.
- (c.) Facility for dyeing.
- (d.) Adaptability for sizing.
- (e.) Minimum chance of impurities as compared with most other fibres.
- (f.) Great strength of fibre as evinced by the fact of its producing a thin paper, and running on the machine unassisted by the addition of any other material.

9. In the resolution marginally cited, the Government Revenue Department of Bengal has recognized the importance of encouraging a plantain fibre extracting industry, and is prepared to give all reasonable assistance to any mercantile firm or individual wishing to try such experiments in the Chittagong Hill Tracts, or elsewhere in Lower Bengal. It has further agreed to supply wild plantain stems free of costs on the spot for a reasonable time, at the outset of the experiment, and will arrange for future supplies at reasonable rates. The firm of Messrs. Schéne, Kilburn and Company have, we believe, turned their attention to the development of this new business, but to what extent we are not prepared to say.

10. Dr. George King, Superintendent of the Royal Botanical Garden, in his able report on plantain fibre, gives it as his opinion that the plantain fibre industry has a good deal of promise, and further states that he has ascertained from a large English paper-maker that if it could be delivered cheaply enough, plantain fibre would be readily bought in England for paper-making. He also states that, as the local demand is very limited, the Bally Mill being the only one in this part of India, London must be looked to as the real market. This latter remark, no doubt, is applicable to the present time; but, if as we predict, at no distant date, India will no longer depend on England for supplies of paper, then the demand for plantain fibre in India will be quite equal to the requirements of England in this respect at present.

ALOE.

11. The paper next to be considered is that made from the fibre of the "aloe." Although this exhibit is a fair sample of the class of paper that can be produced from this plant we are not sanguine of it ever proving a serviceable acquisition to the list of paper-making fibres. For paper purposes it is desirable that the fibre should be the yield of plants of re-

gular growth, which is not the case with the aloe, whose habit is to send out a succession of shoots requiring different modes of treatment that could not be carried out when dealing with large quantities. The paper has a spongy, porous appearance, which is very much against it.

Moonj.

12. To this exhibit we draw particular attention. It is made from the sheath of the grass that was condemned by the Home brokers as containing too small a percentage of fibre (*vide* our concluding remarks, paragraph 4). The quality is stout and surface flat, with inclination to harshness; not in the least bibulous; colour white, which speaks for the bleaching quality of the fibre; fibres well digested, and no appearance of knots; well sized. The slight impurities on the surface give the appearance of the paper having been run on the machine after working "browns." Similar defects from this cause are commonly met with. The creases on folding show a tendency to cut, but to no appreciable extent.

13. This grass, which grows in prolific abundance in many parts of India, offers an inexhaustible supply of fairly good paper material, if it can be delivered at the mill at a reasonable price, and there is no reason why this cannot be done if consignments are freed of all useless material and compressed into the smallest possible bulk.

14. We would recommend that this paper be added to the list given in the Government resolution referred to in the first paragraph of our concluding remarks. It is well suited for vernacular and English correspondence (that is destroyed every third year), for drafting purposes, for scribbling memoranda, and for all printed forms used in departments where the records are not of sufficient importance to be preserved for any considerable time. The Sind administration, we conceive, would consume a great deal of this class of paper with considerable profit to Government.

MOHALYNE.

15. The Mohalyne cream-coloured paper apparently has been made from the *Bauhinia variegata*. The fibre of this creeper which over runs the forests of India, has been pronounced by paper-makers equal to the fibre of the *Adansonia digitata*, which is known to afford a very superior material for paper. The cost of chemicals necessary to convert it into a good white paper, however, weighs too heavily against its other merits to admit of its being utilized for this industry. The present sample, though strong, and of even surface, is wanting in colour, and shows symptoms of difficulty in sizing. Possibly, if delivered at the mill at a sufficiently cheap rate, it might prove serviceable for strong "browns."

JUTE.

16. Of the 16 samples of paper made principally of jute, there is no appreciable difference in their general quality or strength. The varieties in colour go to prove that paper made from jute fibre takes dye well.

17. These 16 exhibits are strong and of a tolerably smooth, flat surface. The felting is good, and there is no sign of knottiness or undigested fibre.

18. A great deal of this paper is already consumed by Government in the form of envelopes, challans, &c.

19. In Carl Hofmann's practical treatise on the manufacture of paper, we find the fact mentioned that the *Dundee Advertiser* is printed on paper made from jute, and also that a large paper-maker had forwarded to a Mr. Ling a beautiful specimen of pure jute paper remarkable for its fineness of texture, cleanness of colour, and great strength. The same author refers to a sample of jute paper said to have been made at the "Cape of Good Hope" that appeared as strong as wash leather.

20. This encouraging mention of jute fibre as a paper material leads us to hope in course of time the Bally Paper

Mill Company will bring paper manufacture from this material to greater perfection.

BLOTTING PAPER.

21. Four samples of blotting paper have been exhibited—blue, cream, grey, and white. They are all equally absorbent, though not bibulous to excess. The quality we consider quite good enough for ordinary use, and a considerable saving will accrue to Government by using this material in place of that obtained from Europe.

CARTRIDGE PAPER.

22. The difference in the strength and quality of the six samples of cartridge paper is hardly sufficient to demand special notice. The principal fibre employed having been jute, the papers are remarkable for their strength. They are in all respects equal to the purposes for which cartridge paper is generally put. The tints are uniform and well selected.

BROWN PAPER.

23. Two samples of "browns" have been exhibited, both of good quality and great strength. They are well suited for packing and other purposes to which this class of paper is generally turned.

24. Before concluding our report on the 41 specimens of machine-made paper, exhibited by the Bally Paper Mill Company, we desire to draw the particular attention of the Committee to the fact that in no instance does an excess of China clay appear to have been employed in the manufacture of the paper.

25. On the foregoing grounds, therefore, we would recommend that the BALLY MILL COMPANY be awarded a "GOLD MEDAL" AND CERTIFICATE OF HONOURABLE MENTION in proof of the high order of merit in which the Committee esteem the industry of paper-making, and in recognition also of the

superior quality of paper manufactured by that Company, in comparison with all other exhibits, and of the praiseworthy efforts that have been made by them to utilize different fibres indigenous to the country.

NATIVE HAND-MADE PAPER.

26. Of the 32 samples of hand-made paper, 12 are exhibited by different manufacturers, and the balance lent by the Economic Museum. The difference in quality between all these exhibits is so trifling that they do not deserve separate notice.

27. The "writings" are coarse in the extreme and wanting in colour and surface; the quality is that to be found in native account books (*roznamas* and *katnhs*) written with native ink. They bear proof of the "stuff" having been over "cooked" where old paper has been used, and undigested "stuff" where gunnies and such like materials have been employed. The system followed by native paper-makers to produce pulp and finally size the half "stuff" defies the production of anything but the rudest materials, such as those now before us. No progress seems to have been made in this art for the last quarter of a century, a period over which our experience extends. Indeed, this industry appears rather to have retrograded than progressed, if the exhibits we are reporting on are to be accepted as fair samples of the present quality of native hand-made papers. Certainly they contrast unfavourably with specimens made in Sind 25 years ago.

28. The "blottings" are merely unsized samples of the papers already reported on and are far too absorbent.

29. The only hand-made paper that calls for marked attention is exhibit No. 53 (Bhootea paper,) not on account of its quality, but for the great toughness of the fibre from which it has been made, which we are inclined to think properly manipulated would make an excellent paper. We would direct the attention of Government to this material.

30. Having passed our opinion on the hand-made papers exhibited, we can do no more. In respect to acknowledgments we must leave the matter entirely in the hands of the Committee, as we are unable conscientiously to recommend any awards.

31. Did native hand-made paper commend itself even on account of cheapness, we might perhaps have felt disposed to suggest the grant of a certificate of honourable mention; but where price and quality are alike against them, as compared with machine-made paper, we can see no good reason for fostering this form of industry or stimulating its growth.

					Rs. A. P.
Average price of machine-made writing paper ...		0	2	10½	per quire.
Ditto . . . ditto brown "	..	0	2	6	"
Ditto . . . ditto cartridge "	..	0	10	1½	"
Ditto . . . ditto blotting "	..	0	6	5	"
Ditto . . . native hand-made "	..	0	6	9	"
Ditto . . . ditto blotting "	..	0	4	0	"

Concluding Remarks.

1. The Government of India, in the resolutions cited in No. 2777, Department of Finance and Commerce, dated 1st September 1881.

No. 237, Department of Finance and Commerce, dated 21st September 1881.

No. 2116, Department of Finance and Commerce, dated 21st December 1881.

to give manufacturers confidence in the existence of a permanent and steady demand, Government is prepared to give contracts for long periods—a system that is best calculated to stimulate the growth of any industry as offering a guarantee for any outlay of time and money.

2. With an assurance of such substantial support, all that appears requisite to ensure the manufacture of paper in

India becoming a most profitable industry is the production of the paper needed, and there is no good reason why this cannot be managed, if the requisite raw material is available and the necessary machinery employed. Climate and dirty water, it is said, are against India ever competing with England in the manufacture of paper. We are not, however, prepared to endorse this opinion, having been informed by experienced and practical paper-makers that the latter obstacle is one easily to be overcome, while the former cannot be of any great moment, now that fresh supplies of chemicals are so readily procurable from England. Possibly climatic influence might interfere with the production of some of the superior classes of writing paper, but certainly not to a sufficient extent to prevent the manufacture of the quality of paper which is principally consumed in Government and commercial offices.

3. To our mind the main difficulty to be surmounted is not the absence of clean water and a suitable climate, but the want of a good, cheap, raw material in sufficient quality; and it is to this subject we would urge the prompt and early attention of Government. No doubt Government has already done much in this direction, but the results have not been as satisfactory as could be desired. From one reason or another, the consignments of fibre sent to England for experiment have been condemned, and the proceedings connected with the shipment are all that remains to show that the fibre has been tried and found wanting.

4. Now we are of opinion, in some instances at least, that had the experiments been made in this country, where the trials could have been renewed at a minimum cost, and the desired references readily obtained, much money might have been saved, and possibly a good paper material discovered. By this we do not for a moment impute neglect or inability to paper-makers in England, but merely wish to impress on Government the obstacles there are in the way of success,

where the seat of experiment, and the country where the material is produced, are separated by any great distance. In our own experience, a large consignment of *Saccharum munja* sent to England for experiment was very lately condemned as yielding too small a percentage of fibre. This decision was accepted as sufficient proof of the unsuitness of this grass for paper, until the report of the brokers reached Mr. Strettell, when on enquiry he ascertained the mistake to have arisen through a silly blunder of sending the stem instead of the sheath of the grass for experiment. That the *Saccharum munja* produces a capital paper material we have ample proof in the sample exhibited by the Bally Paper Mill Company, on the merits of which exhibit we have already reported.

5. It is essential to the success of experiments of whatsoever nature that the material to be experimented on, and all requisite data connected with it, should be ready to the hand of the experimentalist; experiments with paper fibres prove no exception to this rule. If a first trial fail, that is no reason why a second or third should do the same, and it is only by a series of experiments and references that indisputable results can be arrived at. Business men have neither the time nor inclination to enter into lengthy correspondence, which involves an interval of two months at least before the required information can be obtained; and this no doubt is foremost amongst the reasons why our efforts hitherto to introduce Indian fibres into the Home market have been so very unsuccessful.

6. With the double object then of serving the interests of Government and the paper trade, it would, we think, be well if arrangements were entered into with the Bally Mill Company for a series of experiments with Indian fibres, Government supplying gratis the quantity of material requisite. In consideration of their valuable services, we are of opinion that the Bally Mill Company might be allowed the monopoly of Government custom for a number of years,

and that in return for this concession the Bally Mill Company might be required to furnish Government with the professional opinion of the Manager of the Mill on each fibre tried, together with triplicate samples of the following specimens :—

- (1.) Grass in condition received at the Mill.
- (2.) Sample of condition put into boiler.
- (3.) Boiled fibre.
- (4.) Half stuff washed.
- (5.) Half stuff bleached.
- (6.) Paper-made material ~~containing~~ of the stuff.
- (7.) Paper tinted.
- (8.) Paper after being subjected to super-calender pressure.

A systematic enquiry of this nature would in all probability lead to most profitable results, and if not, it would set at rest any divided opinion on the merits of the fibre experimented on.

7. It has been said that the “consumption of paper is the measure of a people’s culture;” and there is no doubt that the demand for paper in India will keep pace with the rapid strides education is making, and with the diversity of soil and climate which India affords, there is no valid reason why she should fail to produce the best of paper-making fibres.

8. Paper-making above all other manufactures deserves special consideration and the most cordial support of Government, for not only is it an industry of the greatest importance, but on it no less than 24 distinct trades are dependent, besides numerous others which are mainly supported by it. Indeed, so great importance do we attach to this trade that we consider that it would best serve the interest of Government and of the commercial community were the undivided services of an expert, specially qualified for the purpose, engaged for this duty in connection with the Bally Mills.

W. H. COGSWELL,
G. W. STRETELL, }
} *Jurors.*

CALCUTTA,

The 23rd March, 1882.

Report on Cotton raised in the Garo Hills, in Orissa, and at Hoshiarpore (Punjab.)

At the General Meeting of the Society in February 1882, the following letters, with specimens therein referred to, were submitted :—

A. From Mr. L. Liotard, of the Revenue and Agricultural Department, a specimen from the Garo Hills. "Will you kindly favour us with your opinion," writes Mr. Liotard"—as to the value of the staple. The Chief Commissioner of Assam, from whom we have received it, speaks of it in high terms; but it does not seem to me to be very good because the cotton adheres so firmly to the seed, because the fibres are small, and because they are hard and unpliant. But I might be wrong, and you will know exactly the real value of the staple. We are anxious to have an authoritative opinion."

B. From Mr. Broomfield of Khorda, Orissa, with the following remarks :—

I herewith forward a little cotton grown in Khorda from foreign seed. The plants from which the cotton was picked are two years old, there are other plants in the place which are over eight years old and they still yield abundantly. The soil is a red gravelly clay, very dry and poor. The yield I estimate to be about 50 lbs. of clean cotton to the acre. Could you let me know the price such cotton would command in the Calcutta market?

Indigo plants are found in bush jungle in these parts, growing in apparently very poor soil. Perhaps people in Calcutta might be induced to establish factories here, if they were made aware of the capabilities of the place to produce Cotton, Indigo, and Silk, besides Kaolin. The establishment of factories would give employment to the poorer ryots who have little or no land of their own. Labour is cheap.

C. From Mr. C. S. Faddy, District Engineer, Hoshiarpore, Punjab, who writes as follows :—

I am sending you by post three samples of cotton.

No. I cleaned, No. II uncleaned, No. III a sample of native *cleaned* cotton picked at random from a heap exposed for sale in a native shop.

Would you kindly afford me a valuation of Nos. I, II. No. II was sown in a field measuring 245 ft. \times 124 ft. or 30,380 sq. feet, in drilled lines 4 ft. apart; one maund of bone dust applied, and the yield has been a few seers over 10 maunds or in round numbers, 800 lbs. of cotton—off a “Ghumoa” or $\frac{2}{3}$ of an acre of land. My chief object, however, in addressing you is to ascertain if you can put me in ~~the~~ way of procuring a cheap simple portable cotton ginn to be worked by hand. The native method of extracting the seed is truly barbarous expensive and very slow. Cotton is now selling (uncleaned) ten seers, or fine quality eight seers per Re. Whereas cleaned Cotton is not to be had at more than $2\frac{1}{2}$ seers per Re., the difference in price representing the cost of extracting the seed.

Under these circumstances the export of cotton from the Province is practically ~~prohibitory~~, and always will remain so until some cheap and simple appliance is brought before the native which will enable him to put the dressed and cleaned staple at a lower price in the market.

The capabilities of this part of the country for cotton producing are practically unlimited, but when we see cotton selling at higher prices here than obtain in the Liverpool or English markets, we are scarcely warranted in anticipating a favourable future for this staple.

If the raw produce could be cleaned, ginned and put into the market at sales favourable for export to Europe, we might then reasonably expect to see a great stimulus to production.

It is quite possible with rational cultivation to raise 11-12 or 16 hundred lbs. of Cotton per acre, giving when cleaned, 5 to 600 lbs. of a good marketable commodity, and with the exception of sugar-cane it is the most profitable crop a ryot can cultivate.

Submitted also the following reports thereon :—

Report by Mr. W. H. Cogswell.—The following is my opinion on the foregoing samples of Cotton referred to :—

A.—A large trade has recently sprung up in this class of Cotton which is grown in the Chittagong and Garo Hills districts. It is being extensively used in the manufacture of Saxon Woollen fabrics on the Continent, being most suitable for mixing with wool, from its hard, harsh, crisp and brittle fibre. It is perfectly useless for ordinary spinning purposes, owing to its want of staple. Its value, however, is considerable for the above mixing purposes, being worth to-day about Rs. 19 per bazar maund.

B.—This is evidently produced from acclimatised seed, probably from Egyptian stock originally, as it possesses the fine silky character of that Cotton ; it is, however, wanting in length and strength of such staple, doubtless owing to the plant not being treated as an annual, but allowed to grow a second year with little, if any, pruning, which causes the deterioration of yield. The quality is too good for the Calcutta market, where the lower counts of yarn only are spun, but in the Liverpool market this would be worth to a home manufacturer about 7d. a lb.

C. I.—Good bright colour, staple fair in length but weak, would class as fine Bengal, worth to-day about Rs. 16-12 to Rs. 17 per bazar maund.

C. II.—Kapas, seed not separated, worth in its present state about Rs. 6 to Rs. 7 per bazar maund.

C. III.—Much stained and almost valueless in consequence. I am of opinion that most of the discolouration is due to the bolls having been allowed to remain on the plants, after having ripened and burst, exposing the cotton to dews and rains. It may also have been much stained in separating the seed by being crushed in the rollers of the native *churka*, but with care that need not arise.

Report by Mr. S. H. Robinson.—I agree with most of Mr. Cogswell's remarks on these samples, but I make an exception in his valuation of the Orissa sample (B), I do not think it would class with Egyptian or New Orleans in the home market, but it would be worth here Rs. 18. to Rs. 19 per maund if properly ginned.

I think with the Secretary there must be some error in the reported yield of the Hoshiarpore. If Mr. Faddy can get even 300 lbs. per acre of clean Cotton like he has grown, it should give a good profit.

[Since the Meeting was held the following correspondence has passed between Mr. Faddy and the Secretary. It is introduced here to make the subject more complete.]

From Mr. Faddy.—Thanks for yours conveying opinion of Cotton Committee just received. There is no mistake in the estimate of yield. The area cropped = 8 Kanals or one Ghumoa of land, 11 Kanals = 1 acre and the yield on the area above mentioned = 10 maunds or 890 lbs. of cotton with seed.

What, however, I wanted to find out was where can cheap efficient machines for cleaning or separating the seed from the staple be procured, the native churka or as it is called up here Behia is rude barbarous and the process very expensive, adding nearly $\frac{1}{2}$ d. per lb. to the cost of the marketable article. The introduction of some machinery which would reduce the cost of putting the staple into the market would be a great thing for the country as I remarked to the Secretary of the Chamber of Commerce. Kappas is procurable at about eight seers per Re. whereas the cotton with seed extracted cannot be procured or purchased at less than 3 lbs. per Rupee, this difference representing the cost of extracting the seed.

If you would give me any information on this point you would oblige me greatly.

From the Secretary.—Your note of the 17th Instant. A cheap and efficient machine for separating the seed from the cotton has long been and is still a *desideratum*. The native

churka is not only slow in action but crushes the seed and so stains the cotton. Many machines have been made in England on the churka principle, but they are not only comparatively costly but do not perform such amount of work as the saw gin. The saw gin, on the other hand, is apt to cut the cotton and our Indian cottons, as a rule, are already of too short a staple to admit of being cut. For long staple cotton, such as "Sea Island," the saw gin is not suited; but this class of cotton, with black seed, not adhering tenaciously to the wool, can be readily separated by the churka. Such cotton, however, forms but a small proportion of Native growth. The subject has for many years engaged the attention of the Society and several papers are published in its Journal, but, as already mentioned, a suitable machine, combining efficiency with cheapness, remains a *desideratum*.

Your estimate of yield of your cotton is simply marvellous, and shews how admirably adapted are both soil and climate of your district for this important staple.

Report on Cotton raised at Jallander.

AT the General Meeting in April 1882 the following letter was read from Mr. A. A. Shireore, Jallander City, on two samples of cotton grown by him:—

I have much pleasure in sending you per parcel post two samples of cotton grown by me, one sample with seeds the other without.

The yield has averaged about 600 lbs. of cotton with seeds per acre, on a small plot of land irrigated by well water. I consider this return as normal and the same yield can be obtained by myriads of cultivators in this and the adjoining districts of Hoshiarpur, Kappurthalla, and Ludhiana. A large return could very easily be obtained on first class soil and by good cultivation. I think it quite possible to produce 800 lbs. of uncleaned cotton on an acre of land.

The cultivators in these parts would gladly avail themselves of producing any profitable crops, if they only know how to go about it. They appear to be very backward in agricultural matters.

The Government does next to nothing, and there are no European traders or residents to improve their condition.

The cotton you will readily see is from American seed. I am unable to state what particular class it is styled in the trade; but I believe there are two or three varieties, judging from the pods produced. The seed was sent to me by the Government of Bombay in one bag without any particulars being noted.

A large amount of cotton is grown in these parts on irrigated and unirrigated land, but it is of a very inferior description, as you will see from the enclosed sample of the indigenous kind, after comparing it with that grown by me.

The cotton has been ginned by the usual native method. The proportion of cotton to seed is 25.68 to 32 per hundred.

It is a great pity the agricultural resources of these parts are literally wasted.

If Government took vigorous and forced measures to improve the quality and yield of cotton, I am of opinion a very large amount and of superior quality could be exported to the English and European markets in a couple of years to the enrichment of the Government and ignorant peasants. Will you be kind enough to let me know the opinion of the Society on the cotton sent, and the price it will fetch in European markets.

Submitted the following reports thereon :—

Note by Mr. S. H. Robinson.—The Jallander cotton is much better than the samples recently sent to the Society from Hoshiarpur for report, it is much superior in staple to the generality of cotton grown in Bengal, North-West, or Central Provinces, and would spin easily into 40s. to 50s. twist. It has good strength and color and at Liverpool

would class with Orleans and be worth at present 5½ to 6d. per lb. With the yield reported by Mr. Shircore, 600 or 800 lbs. per acre of cleaned cotton, it ought to pay well to cultivate, and would not require any aid from Government.

The native cotton would class with first quality Cawnpur worth at present Rs. 16-8 per maund in Calcutta.

Both samples are inferior in color in the cleaned state to those with the seed—probably from bad ginning.

Note by Mr. W. H. Cogswell.—The Jallander sample grown by Mr. Shircore is most creditable. The staple is even, soft, almost silky, good color, and of fair strength, of too good a quality for consumption in this country, as the local mills spin low counts only of yarn, but for 40s. and upwards the twist manufacturers in England would be ready buyers at fair market prices. It partakes more of the Sea Island than the Orleans type, in appearance and softness to the touch, and might realize 7d. per lb. Such a result in quality and quantity produced, proves that the climate and soil are favourable, and that the cultivator possesses the needful knowledge to enable him to act independently of Government aid.

If Mr. Shircore placed the result before the leading Zemindars and cultivators there is every inducement for them to follow his good example, and reap the full benefit from the use of good seed and improved cultivation.

The native grown sample is of the ordinary class of fair Bengal, short staple, and worth about Rs. 15-8 per maund in the Calcutta market. The difference in color between the samples in their unginned state or not churkaed, and the cleaned one, may in my opinion be guarded against in separating the seed more carefully, and not exposing the cotton to dust, dirt, and to less dirty handling.

*Note on Cacao, (*Theobroma Cacao*.) BY THE SECRETARY.*

It is satisfactory to know that though some of our older Indian products, notably silk and indigo, are not what they

were, there are others which have taken their place to some extent, primarily tea, and now wheat and tobacco. There is another product to which attention might be directed with advantage, namely, Cacao. All attempts to raise the *Theobroma Cacao* in Bengal appear to have failed ; the tree attains a certain age and then dies. But there are other parts of India where the climate might be found suitable to its production. Perceiving that it is not prudent to trust so much to one industry,—and that industry suffering so severely from a disease which has hitherto baffled all attempts towards eradication—the Ceylon planters are now turning their attention to Cinchona, Tea, Caoutchouc-yielders and Cacao. As respects the two former they have apparently met with sufficient encouragement to move onwards. The following extract from a letter which has been kindly placed at my disposal by a Member of a firm in London, who are largely connected with Indian and Colonial products is, I think, sufficiently interesting to induce me to bring it to the notice of the Society. Though it refers specially to Ceylon, the remarks contained therein need not be confined to that island for, as already observed, there are several localities in India where the Chocolate tree might be successfully cultivated. The writer of the following remarks has assured me that he has been much surprised and gratified to find how excellent is the quality of the Ceylon Cacao,—approaching very closely that of Trinidad.

“ It is very gratifying to notice that while Ceylon Coffee Planters are in a state of depression with regard to the cultivation of Coffee, owing chiefly to the awful scourge of the leaf disease, aggravated by adverse weather, their attention should be directed to the cultivation of other articles which appear to be coming to the foreground by further developing the capabilities of the Island. It is also of material advantage that a prominent position has been given to the article of *Cocoa* (or more properly Cacao) in the extracts of Dr. Trimen’s report appearing in the *Observer* of the 6th May.

There is, however, no need to be alarmed that Coffee cultivation in Ceylon is a thing of the past, but as time advances, skill and enterprise must necessarily be also directed to the production of other articles for which the soil of Ceylon is admirably adapted. We have already seen the satisfactory progress made in Cinchona and Tea, and there is every reason to believe that *Cocoa* promises to occupy an important position in the products from Ceylon. The small quantities which have already appeared in this market adduce sufficient evidence of the value in which it is held, and no doubt can be entertained that with proper care and attention, this article may rank amongst the highest qualities produced in any part of the world. Trinidad of course, as we all know, produces the largest supply, but Ceylon has yielded in the comparatively small quantity sent, a *quality* much appreciated by some of our best Chocolate manufacturers.

The report already alluded to and extracted so copiously in the *Observer* should be of very practical utility to Ceylon Planters. But while selection of plants and suitable localities are essential to favourable results, and judicious pruning highly necessary for full productiveness, the question of *fermentation* is one of material importance.

It is difficult to draw strict rules as to the requisite time for this process to be carried on, as much depends on circumstances. While forty-eight hours might be sufficient in one case, five or six days might not be too much in another,—all depending on the amount of heat generated in the process of fermentation, and which can only be ascertained by watching the progress most attentively. Four days would appear in most instances sufficient. If allowed to be too long, the Cocoa becomes heated and burnt, and thereby loses much of its aroma and colour; but if too short a time, the moisture is not sufficiently driven out, and the nuts become mildewy and decayed. A healthy brightness of colour with fulness of aroma are the desirable results; and it may also be re-

marked that it is the *insides* of the nuts which are subjected to this test and not the skin. These few observations are offered for the purpose of rendering some assistance if possible in the encouragement of a branch of industry, for which there is ample scope for development, and may ultimately prove of substantial remuneration to those engaged in the productions of Ceylon."

26th June, 1882.

A plant which replaces the Vine.

SUFFICIENT publicity can scarcely be given to all the discoveries which particularly concern the first of all the industries, the agricultural industry.

Under this heading, important and good news have been received from the centre of France.

All the world is aware of the enormous losses sustained by our national agriculture since the last 20 years, owing to the havoc of the *Phylloxera*; more than half of the French vines have already disappeared, and no one can foresee the limits of the depredations of this terrible destroyer. In vain, have they employed remedies after remedies, ingredients after ingredients; nothing has succeeded, and until now those who have made experiments have done so without success. Notwithstanding the thousand and one recipes used at different times to overcome and destroy it, the phylloxera is not overcome and continues to destroy at leisure our splendid and flourishing vineyards.

In presence of a similar disaster a bold expert, whose work has already received the sanction and encouragement of the learned Societies, after many fruitless trials to check the evil, has succeeded not in overcoming it, but in turning its course. Abandoning, therefore, the vine to its unlucky fate, he sought if they could not find in another vegetable, the elements of prosperity which have failed owing to the disappearance of this precious plant.

This plant has recently been found ; it is a species of *red beetroot*, unequalled in the whole world by its incomparable qualities.

As is known the beetroot produces alcohol of superior quality ; why, therefore, would not its pulp manipulated as the must of the grape, produce an equivalent beverage ?

This has been done ; this red Beetroot, which is very sweet, produces by fermentation a wine which is in no way inferior to very many of the wines, supposed to be from the southern soil. Besides, it has the immense advantage of growing in every soil and principally in every climate ; a double reason to make it known to the agriculturist.

The wine of the Beetroot ! This is what we want to make known, should it be but to cause further researches or even give new resources to our wine growers in distress.

To make this plant known to all, the promoter places himself gratuitously at the call of the agriculturists to supply them with the seeds they may require. You may, therefore, address yourself with full confidence to M. Auguste Deleuil, Agronomist (?) at Gardonne, near Marseilles, (France.)

*Particulars regarding model of a Machine for cleaning the leaves of the Henequen plant (*Agave Sisalensis*.) (Communicated by the Government of India.)*

THE model is one-eighth ($\frac{1}{8}$) size of machine in actual use.

Henequen leaves are about four feet long, thick at the butt and tapering to a point.

Power is transmitted through a belt to the wheel A in the direction of the arrows, which turns the cleaning wheel B in the same direction and at a very high velocity. The butt end of the leaf is grasped by the jaw and lever F, the point introduced through the opening in the cover I marked H, the curved bar D is then pressed up by the lever G bringing the leaf into contact with the scrapers C C C (which in the

original are of brass.) Half of the leaf is thus cleaned. The lever G is released then the jaw F, the leaf is withdrawn, the fibrous cleaned portion is twisted in a peculiar manner around the pin E and the other half cleaned as before.

Note regarding Cochineal. By THE SECRETARY.

I observe that the subject of the culture of the *Grana fina* Cochineal in Southern India have been again attracting attention, and that the Government have approved of a suggestion that has been made for that purpose; moreover, that the Agri-Horticultural Society of Madras have been requested to grant a portion of their garden for that purpose. It may be in the recollection of a few of our oldest members that some efforts were made by our Society, many years ago, towards the introduction of this variety into Bengal. The insect and the plant on which it feeds, were obtained from the Island of Bourbon (Reunion) and a careful series of trials were made in the Society's garden, which, unfortunately, resulted in a total failure. The damp and unequal climate of lower Bengal, were evidently unsuited. Attempts were subsequently made in the Punjab, but, I believe, these also proved unsatisfactory. It is not, however, unreasonable to suppose that with the selection of proper localities in a congenial climate, combined with carefully conducted experiments, this exotic variety might be successfully introduced. Whether the climate of Southern India is favorable to the *Grana fina* remains to be seen, but I think it questionable; it not being, I fear, sufficiently equable.

When the attempts were made in the Madras Presidency at the close of the last century, for the acclimatization of the exotic variety, and when subsequent attempts were undertaken nearly 50 years ago by our Society, the value of Cochineal was considerably greater than at the present day, synthetic dyes were then unknown. These have so much

reduced the value of Cochineal and Lac also, that it is questionable whether it would be found profitable, at the present day, to rear the insect in any part of India for exportation to Europe; and whether, as remarked by me on a former occasion, when alluding to this dye, it would be possible for India to compete with any prospect of profit, in the face of a plentiful supply being available so much nearer the consuming countries.

NOTE.—Whilst there has been a *slight* increase of import of Cochineal, during last year (1881,) into Great Britain, principally from Teneriffe (from Mexico and Honduras it is so trifling as scarcely to be taken into account) there has been a steady decrease of consumption. So seriously have the aniline dyes affected it, that the price is now reduced to the insignificant rate of 1s. 4d. per lb. I learn from a reliable source that in all probability it will continue to be depressed, and almost go out of consumption by the use of artificial dyes. Lac dye has, it seems, no effect on Cochineal, but it is also apparently dying out.

The Coffee Plant of Liberia. By M. P. DABRY DE THEIRSAUT,
Consul General and chargé d'affaires of France at Guatemala.

FEW persons have heard till now of the coffee of Liberia. However, as this species will soon be called to compete seriously with the coffee of Arabia, and to enrich at the same time a great number of tropical countries, we think that great service may be rendered to agriculture and commerce, in indicating from whence this precious alimentary substance is got, which plant produced it, how this plant is cultivated, which are the climates, the soil, the temperature suited to it, and lastly what part the alimentation may draw.

Such is our object in publishing this notice. We advise, at the same time, the persons who desire more complete informations to consult the two only works we could procure on the subject, viz., 1st—Notes on Liberian coffee, its history and

cultivation, by D. Morris, Jamaica Government, printing establishment; 2nd—Liberian coffee in Ceylon, Haddenat Company, London.

Discovered, as is said, by the Swedish Botanist, Adam Afzélius, author of the flora of Sierra Leone, the coffee plant of Liberia, which was afterwards scientifically described by M. Hiern, received its specific name from the small Republic of Libeira, situated on the western coast of Africa by $4^{\circ} 45'$ north latitude and $11^{\circ} 14'$ west longitude. The population of this small State, which is 300 miles long and about 100 miles broad, is about 1,500,000 souls, including the aborigines. Monrovia, its capital, thus named in honor of a President of the United States, and which comprises 4,000 inhabitants, was built at the mouth of the river Mesurado.

The Republic of Liberia was founded in 1823 by 10,000 released negroes under the patronage of the Society of American Colonization. After having enjoyed during a certain time the Protectorship of the United States the young colony, in 1830, formed itself into a Republic, and elected a President, M. Robert. Its present President who was placed in power in 1878, is the Honorable Anth.. W. Gardner. The General Budget for 1880 was for £25,000.

The principal interest which this microscopical State presents, is having brought to notice the existence of a native coffee plant, whose botanical characters differ from those of the coffee plant of Arabia (*Coffea Arabica*.) Instead of being a shrub it is a regular tree which attains 30 feet in height. Its form, like that of the coffee plant of Arabia, is pyramidal, its trunk straight, and its central root fibrous, very developed and of brown colour. Branches by pairs shoot up from the trunk at certain distances, and so disposed that a pair crosses perpendicularly the previous pair. These branches which are opposite to each other are flexible, almost cylindrical, knotty, and covered like the trunk with a bark more rough and more brown than that of the coffee plant of Arabia. The leaves are tough, deeply wrinkled, acuminate, a little sinuous on the borders, of greenish colour, very brilliant, oval, measuring from 6 to 14 inches in

length, or 2 to 6 inches in breadth. They are supported by short very strong stalks. The lateral veins comprise 8 to 12 pairs with glands in the cavities opening below by a small orifice. The white petals, strong, being nearly two inches in diameter and strongly soldered, are 6 or 8 in number instead of 5 as in the coffee plant of Arabia. The peduncle is short and very strong. The fruit is an oval berry of three-fourths to one inch in length of a grizzly-red, covered with a fibrous envelope and slightly rough to the touch, containing very little pulposous matter, longitudinally veined. The pulp is thick, a little fibrous, more or less plump, a little sweet, but less than the pulp of the coffee plant of Arabia. The parchment is dark brown. The testa is strong, resisting, and envelopes the berry well. The seeds are generally double. As is sometimes the case, whilst one fails the other becomes large and round.

A great advantage that the coffee plant of Liberia possesses, is that the fruit is strongly attached to the branches and does not fall when ripe, as easily as the coffee of Arabia, thus requiring less labour for the harvest. The flowers resist equally well to the puff of wind. This is not all: it is much stronger than the plant of Arabia, and is not so much damaged by the numberless enemies to which are exposed the precious plant. Thus it has been remarked that at Ceylon the *Hemileya vastatrix*, instead of making the leaves drop, contents itself by piercing them; but as they are very long and very large, they can continue their economic function. It is the same of the insects which, up to the present, have caused it insignificant damages.

The coffee plant of Liberia is more fruitful than that of Arabia. At 20 months it attains from 3 to 5 feet in height; flowers and fruits on the 28 months. Seeds sown in Ceylon in the botanical garden of Peradenia in March 1874, produced plants which flowered 18 months after. In March 1876, new flowers, and in December of the same year first crop very abundant. In March 1877, other blossoms and at the end of the year, splendid harvest. Afterwards the plants blossomed partially and at intervals varying from 2 to 3 months, and since have fruited at different periods, although the principal blossoming at Ceylon is in March,

and the most important harvest at the end of December. The third year, a good harvest may be expected with a succession of flowering, every 2 or 3 months. At Liberia the coffee plant commences to shoot its secondary branches three years after it has been sown.

It produces more fruits than the coffee plant of Arabia: and you can get on an average from each tree when well cultivated, 6 to 8 pounds and 2,200 to 3,000 pounds from one acre (40 acres 47 centiares) containing 400 trees. In 1877, a tree aged 3 years, in a plantation of Mansawa (Ceylon) measuring, as is said, 10 feet high, was covered with 1,200 large berries of which 23 in one bunch. After a recent article of the *Ceylon Observer* a property of 100 acres in Wellamaya obtained from 6 to 800 pounds per acre, although some of the coffee plants were aged less than 2 years. In Kalutara, the average of the outturn of a plantation was, in 1877, of 1,500 berries per plant, which at 150 bushels per acre, is equal to 8-3 cwt. of cleaned coffee.

According to the news from Ceylon 1880, the harvest of the coffee of Liberia in the island was estimated at a rate of 6 to 800 pounds per acre.

In Dominic Doctor Imray counted more than 18 or 24 berries in the cavities of two opposite leaves.

In recapitulation, the production of the coffee plant of Liberia is not to be compared with that of its allied species of Arabia as to quantity.

As regards its longevity, it is evidently more extended. There exists at Liberia coffee plants more than 50 years old, which still have all the strength of youth, and whose branches bend with the weight of the berries. Plants of more than 60 years, cut short to the trunk, have given shoots with more rapidity and force than the plants proceeding from the sowing.

The coffee plant of Liberia prefers the warm humid and stimulating climate of the plains. The temperature most suited to it is an average of 22 to 28 degrees centigrades in the shade. It likes plenty of rain; at Liberia the annual average of the rain is 187 inches. However, according to the opinion of M. D. Morris and other competent planters, the annual average of 90 inches

and even 70 inches, is even sufficient for the land adapted to this cultivation, and provided that the necessary precautions have been taken to shelter the plant from too strong winds and from the heat of the sun. But, in short, the coffee plant of Liberia thrives better in humid climates, which do not prevent it, notwithstanding the strength and length of its central root, resisting a long period of dryness, as it often happens at Liberia, when the dry weather lasts from May to November.

It grows as well in the plains as on the declivity of the hills, provided the water in the plains be not stagnant and the vegetable loam on the declivity be not exposed to be washed away by the rains.

The way in which the coffee plant of Liberia has to be cultivated with advantage is worthy of consideration. In fact, the primary expenses of purchase, the cost of cleaning, cultivating, and transport are, as is known, less expensive for a property situated in the plains, especially when it is at a short distance from the sea. Or, the altitude most suited to this variety is, from the border of the sea till a height of 800 feet, which seems to be the maximum limit for its good growth. Above 800 feet, the unsatisfactory results which have been obtained up to the present, either in Brazil, India, or in the British Antilles, confirm this data which seems correct. It is possible that later on, either by grafting or by a special method of cultivation, or owing to exceptional grounds and to particular atmospheric circumstances, this altitude may be surpassed, as has been tried with success in the botanical gardens of Peradenia (Ceylon) which are situated at 1,700 feet above the level of the sea; it is, however, a plant of the coast, and one would be liable to error in wishing to cultivate it in the same regions as the coffee plant of Arabia, which is more suited to an altitude varying from 1,800 to 4,500 feet.

The best lands for the cultivation of the coffee plant of Liberia, are those which contain a great part of vegetable earth, with an under soil free and rich. It is necessary above all that its central root, which is very developed, be not stopped in its extension by obstacles such as metallic veins, rocks, compact, and

impervious clay, which in causing the roots to double up, might cause the death of the plant. The marshy aluminous, ferruginous, marly, purely clayey, and too dry lands ought to be avoided as much as possible. The suitable lands are those of volcanic formation, containing abundant vegetable deposits, those which being clayey are at the same time stony, and lastly the sandy and stony lands with vegetable deposits in equal quantities. Lands mixed with small and large stones, are as a rule very good for the plantation of coffee, these stones preventing the upper vegetable earth from being washed away by the rains; by their slow disaggregation form precious salts and undoubtedly by maintaining an equal temperature during the cold nights, helps the growth of the plants. The best under soil is that which is formed of soft and permeable clay.

The planters of Liberia recommend for the cultivation of their coffee plant, the soil of young forests which is not compact but of middling consistency; they add that an ordinary soil is equally good when it contains the necessary nourishment for the plant, or that it may be supplied them when wanting; they further add that the plant likes the low soil of the plains, on condition it be well drained, and that its cultivation on the declivity of the hills, which have natural drainage, gives also very good results when the soil is rich and fertile.

In selecting the lands, the topographic position or rather the exposure requires great care. It is indispensable that the coffee plant be protected from the raging winds by means of high trees or by natural obstacles, such as hillocks, forests, &c., otherwise the winds blowing with too much strength, and unchecked, would destroy the flower, shake the plant and separate circularly the earth at the roots. The air then penetrating by this opening would dry the earth and deprive the plant of the dampness required; it breaks at times the leaves and thus suppresses its breathing organs. On the other side, it is necessary that the coffee plant be placed in a place which permits the air to circulate freely to enable the plant to develop and fruit.

As much as possible, the plantations should not be exposed to the rising sun. During the foggy nights, a certain quantity of

dew falls on the plants and forms into drops, which disappear by evaporation. These drops act as lentils with the first rays of the sun, and can consequently burn some parts of the plant or the leaves, which would be of no great consequence, but the burning of the seeds before they are ripe would be much more serious. The best exposure is that which permits the plant to receive the rays of the sun an hour or two after its rising and during 4 or 5 hours.

The Liberians believe that their coffee plant being native, it does not suffer from the heat of the sun when planted in a soil suited to it, whereas the shade interferes with the abundance and quality of the crop; they admit at the same time that, in a country, when the annual rainfall does not exceed 80 inches, where the altitude is more than 800 feet above the level of the sea, the partial shade for the young plants is necessary, and that during the dry weather, it is necessary to put at the foot of the plants dry grass, straw, leaves, saw dust, and in a word every thing that helps towards keeping the soil cool and preventing the evaporation of the dampness.

What is especially objectionable to the shade, is that it facilitates the formation of very thin long primary branches, and delays at the same time the secondary branches which, projecting here and there along the primary ones, are weak and brittle. It is true that this inconvenience can be overcome by planting trees destined to cause shade at the time of the formation of the plant. The plant has thus the time to shoot good and strong primary branches, with thin complement of secondary branches before being affected by the shade.

Some agriculturists recommend the shade of the afternoon which is not very strong.

The general opinion of the planters, who have made numerous experiments on the subject, is that partial shade is necessary for the nurseries, and when the plantations are situated in localities a little above the level of the sea, when the average rainfall does not exceed 70 to 80 inches per year; but that the plants once placed in rich and deep soil with a sufficient quantity of dampness, can bear, without fear, the

sun, which would prove beneficial. There exists in certain countries a strong reason to shelter the coffee plantations, owing to the dry weather which lasts 7 or 8 months and less frequently 5 or 6. For a plant having roots as superficial as the coffee plant, it cannot possibly resist such a lengthy want of an element indispensable to its existence, unless it be provided with means to attenuate and weaken the constant action of a tropical sun.

It is for the planters to study what ought to be done with reference to the question of shade, according to the places they inhabit. There are two ways of making a plantation, either by sowing on the spot when the plant is to remain, or in making a nursery and transplanting the plants afterwards to the places they are to occupy.

The nursery has the advantage of being less expensive in this way, that it allows the planter to attend on a large number of plants in a small space of ground, and in having in hand at the same time, the number of plants which he might require to change in the coffee plantation. The lands most suited for a bed, are those which are composed of mixed clay with a mould obtained by means of organic remains or of rotten leaves, and an equal quantity of sand, which gives consistency to the clay when wet and causes the excess water to flow out, whilst the clay retains in the cavities of the soil the water necessary for the germination. A good soil of a garden well manured, is equally good for a bed, which must be protected from the strong winds, the heat of the sun, and from the frosts. As regards the nature of the land, it ought in general to be of an average consistency and fertility. If the land be too hard, it would prevent the development of the roots, and if too light, it would dry up very easily and would require constant watering.

When a bed is being prepared, seeds which can easily develop their germinative powers, much first of all, be procured. The seeds ought to be very ripe and as fresh as possible. If the albumen has been injured by dampness or fermentation, or if it has been exposed to the influence of a too dry atmosphere, it would be incapable of giving the young plants sufficient

nourishment; it is owing to this, that the seeds of the coffee of Liberia imported in other countries have often produced plants without health or strength. When the seeds are of good quality and ripe, and if properly sown, 96 to 98 per 100 ought to germinate, and at least 94 per 100 produce good and healthy plants.

The seeds of the coffee of Liberia as well as other seeds, ought to receive the quantity of dampness, heat and air required. The dampness may be supplied them by means of regular watering, morning and night. On the other hand it must be kept in mind that too much water injures the young plants and makes them weak and sickly.

We will not speak about the disposition of the bed, every body settling it according to his way. The seeds ought to be placed at such a depth, that being deprived of light they get the required heat, and absorb the oxygen of air necessary to their development.

On the quality of the earth depends the depth at which the seeds ought to be placed. This depth ought to be less if the lands are hard.

The seeds can be sown either in open air or in deep boxes. Any how the soil ought to be so prepared as to enable the central root to develop.

The seeds once sown, ought to be sprinkled over with vegetable earth which would permit the plant coming up easily. A light covering of large leaves or a little raw wood ought to be spread on the bed.

The time of preparing the beds ought to be fixed according to the rains. It is preferable sowing on a cloudy or rainy day: it is most convenient to always prepare double the number of beds to the plants you wish to sow. The losses invariably surpass the plants provided and care must be taken to replace the plants which are numerous. On the other hand, all the plants are not in a fit condition to transplant, and you must reckon that a great number of plants will be useless.

The principal care which the young plants require, consist in ridding them of the grass which covers the bed, in separating

them when too close to one another, in watering them properly and in sheltering them as has been said.

The seeds of the coffee plant of Liberia germinate slower than those of the coffee plant of Arabia. Generally after a certain time, varying from 40 to 45 days, raise the covering and you will find that plants have grown 2 or $2\frac{1}{2}$ inches high. A cleaning is then given to the beds and the fallen plants propped up. You must wait again a few days before tilling to allow the plant to strengthen.

When the first long leaves, which grow above those in the shape of butterfly's wing, have opened, transplant the plant from the bed to the nursery.

The quality of the earth and the preparation of the nursery are the same as those of the bed.

The ground ought to be as close as possible to the place where the final plantation is to be made. The carriage expenses would thus be avoided, and the plants will suffer necessarily less than if they were brought from a distance.

The soils of the lands ought to be equal as much as possible. Otherwise the change might cause the plants to perish.

Besides, in selecting a ground, care must be taken that the soil to be cultivated be of sufficient depth to allow the central root to extend properly.

The plants require, as has been said above, partial shade when the soil is not rich. They may be protected from the rays of the sun, by means of trees or small thatched sheds. There ought not to be too much shade and the shed ought gradually to be taken off when the plants can bear the effects of the light and the sun.

The transplantation may be made when the plant is 6 mon and shoots three pairs of leaves. Time may be allowed that plant be stronger; the transplantation being a forced state & otherwise a revolution for the plant, the stronger and health plants resist naturally better this revolution.

The plants may be transplanted either with lumps of earth naked. In some countries, some sort of tube or pot in clay w.... cowdung is used and then buried with the plant, and as the

lower portion is soon softened by the damp, the central root pierces it without difficulty. Besides good manure is thus obtained.

When the transplantation is made with the earth protecting the roots of the plants, care should be taken that this earth be entire from the nursery, and proportionately large to the plant, so as to support the roots well.

If ever it happens, as it has often happened, that a part of the root be uncovered, it ought to be cut obliquely with a sharp instrument. But this operation instead of being made at the time of the removal, ought to be made when planting, so as to avoid the loss of juice, and at the same time that the root be protected from the drying action of the air.

This operation is to be considered as indispensable for the development and existence of the plant. If the plant be placed in the ground with a part of the root uncovered, the root would double up and take the shape of a screw. The plant could not then be maintained sufficiently and would soon perish.

The transplantation ought to be made at the beginning of the rains, in cloudy and slighty rainy weather, but never with a strong rain.

Some time before this operation, the ground, after having been cleared and cleaned, ought to be divided into squares or any other required form. These divisions made, mark the spots which the plants are to occupy. For this purpose, use small sticks, which place in the ground at selected distances.

The points once marked, remove the sticks, and make holes having at least 24 inches in diameter at the opening, 18 inches at the base, and 24 inches in depth. The holes ought to be made before hand, so as the earth placed above the surface be ready prepared when the plant is placed.

We say nothing about the manner of fixing the plant in the hole, this operation being the same as for the coffee plant of Arabia. In both cases, care should be taken, that the vegetable earth to be used, be freed of the stones or living roots it may contain, and that the plant be placed in the centre of the hole, and covered, with earth taken from either side of the holes and

not with the earth taken from the holes. The plant well fixed, place a little earth round the plant, say 3 or 4 inches high, to prevent the water from stagnating.

Now at what distance ought the coffee plants to be placed? Or, how far apart ought they to be from one another? By the information received from the planters of Liberia, Jamaica, and Ceylon, &c., the best distance at which the coffee plants are to be placed is, 12 feet on all sides, or 12 or 15 inches from line to line, or 8 or 10 feet in the same line if the top of the plants have been struck off. In the latter case, if the soil is very rich, it is better to leave a space of at least 15 feet between the trees.

If the plants be closer, their branches or roots, deprived of the beneficial influence of the air or the sun, form a regular labyrinth; the harvest is more difficult, and the necessary care cannot be given so easily to the plant.

Ought the coffee plants of Liberia to be pruned? This question, as well as for the coffee plant of Arabia, has not been definitely settled yet. Some affirm that the coffee plants, placed at convenient distances from one another, in a good soil, to which may be easily restored in a solvable and assimilable state, the inorganic substances necessary to the development and fruiting of the tree, which have been removed by previous harvests, would produce annually a greater quantity of fruits, more precious and of better quality, than if they were allowed to grow at liberty, rather than being subject to pruning, which in depriving the plant of a portion of its breathing organs, causes, that the nourishment does not take effect with the energy required by the good physical condition of the vegetable.

The majority of other agriculturists are of a different opinion. In abandoning, as they say, the sap to its natural power of expansion, a portion of its strengthening and nutritive substance gets used in the formation and maintenance of the wood of a number of branches which are not productive and which subsist at the expense of the latter. Then results a loss, more or less great, of the productive power of the tree in flower or in fruits, whereas by pruning you rid it of its superfluous or dead branches, and maintain the equilibrium of the sap which is

driven towards the horizontal branches instead of allowing them to go to the vertical branches, which being stouter and longer require more nourishment; it is thus that there is obtained an abundant, regular and prolonged harvest of good quality, in exhausting less the soil and the tree itself.

The pruning consists of two operations, the *ecimage* and the *elagage*.

The *ecimage* consists in cutting the head or top of the stem of the plant at a certain height.

The stem, as is known, is the fundamental part of the plant; it is the continuation of the root. In *exogenous* plants, like the coffee plant, it takes the name of trunk, has a conical shape, rises single and without branches till a certain height and then branches out and produces a top of different shape; but what distinguishes it is that it presents a distinct bark and composed interiorly of wood of concentric and double layers. Its growth in diameter is explained by the interposition of new fibres and new veins between the ligneous body and the bark. The growth in height takes place owing to the development of the shoot which ends the young stem, and which in growing forms a scion whose height is added to that of the primitive stem, the terminal shoot communicates with many parts of stem or of the branch which supports it, so that when it develops itself, the parts of the young scion communicate with the corresponding parts of the branch placed immediately above, but by degrees as the young scion gets long and forms in itself a ligneous coating and a *liber*, the parts of the stem placed above grows annually in diameter, that is a new ligneous coating is added to those already existing, and stops at the point from whence the new scion started. Each year a new terminal shoot in developing itself gives birth to a new scion which thus increases annually the height of the stem. If the terminal shoot be suppressed, or if it gets spoilt, the stem ceases to grow, and the development of the vegetable takes place exclusively in lateral directions.

Such is the end of the *ecimage* which ought to be made when the scion is ripe at 3 or 5 inches above the terminal shoot. After having cut, with a sharp instrument, the scion at the

required height, care should be taken to preserve near the cut, at a few centimeters above, a pair of primary branches which some cut at 2 or 3 inches from its joining point with the stem, and which others leave intact, being content with the secondary branches which grow on it. It is not sufficient to prune the tree over to maintain it at the required height, the operation ought to be made every year, at the time when the tree has less sap; as regards the height at which the tree ought to be cut and maintained, it depends on its habit, on the nature of the soil and climate, as well as the facility of manuring the ground.

At Liberia, the coffee plants are pruned at a height which is never less than 5 feet owing to the primary lateral branches. Some planters leave the plants 8 feet high, to be more conver-sant of the height to be allowed to the trees; trials must be made from 5 feet.

You may equally try, if the coffee plants are placed in hedges, a system which is extoled by some agriculturists and which consists in pruning the half of the trees in the same line and leaving the other half to grow to its proper height. By this process the plants do not interfere with one another, and the superior branches inclining do not stop the fertile action of the sun on the soil. Besides, as the plants, which have not been pruned, are more precocious because they are more exposed to the air and the sun, the fruits attain maturity sooner. During the years which are plentiful, labor is sometimes wanting for the harvest, it is therefore an advantage in having plants which are slow and others precocious of which the harvest is successive.

When the top of the stem has been cut, small shoots called *glutons* rise immediately above the two lateral branches which have been left. These two shoots form new stems if they be not stopped. It is to be cut annually after the harvest, as well as all branches growing vertically, so as to maintain the plant at the same height.

The pruning operation presents many advantages: the maintenance of the coffee plant and the harvest is considerably facilitated. Otherwise, when the plant has attained 25 or 30 feet in height, ladders must be used to collect the seeds. You run

the risk of breaking the branches in fruit, of destroying the stems and the flowers, and consequently harm the following harvest. The plant pruned is less exposed to the storm. Its form gets perfect. The sap unable to go to the superior parts, falls and gets into the fruiting branches. The inferior branches acquire more strength and vigour, and its superior branches do not double up to the prejudice of other branches, of the neighbouring plants and of the trunk which sometimes splits when the weight of the fruit is too great.

The *elagage* has for its object to strip the plant of all the dead branches which it contains, and of all those which are unproductive and which having acquired a great extension and thickness without having any shoots consume all the sap to the detriment of the fruiting branches. It is for this it has received the name of glutton branches. The branching out results from the developments of the shoots, which after having appeared on the stem, allongate in branches, which in their turn bear new shoots which give birth to other shoots, and so on : the branches are really new stems sprouting on the principal stem from which it draws its nourishment, so as the first generation of the branches on the stem of some vegetable may be considered as a production of secondary axle from which rise and will very often rise tertiary *axles*. Amongst the branches of fruiting plants a certain number only are fruitful.

Each year there are formed, on the shoots or scions which have sprung up the previous year, new shoots which are like the continuation of the first. It is not these shoots which bear fruit, it is the exclusive division of those which have just produced. Thus, the coffee collected during the year is not the produce of the shoots which have grown the same year, but comes from the shoots of the previous year. The sap tending to rise with greater force and abundance towards the extremities of the branches, it results that the power of growth, produce at these extremities only new flowery and fruitful shoots, whilst the inferior shoots all along the branch are stopped in their evolution, and there is real development only in the three or four last shoots. If you examine for example a primary branch

of a coffee plant of nine months, you will distinguish three parts: the one is closer to the trunk and has no leaves, with inactive shoots: a middling part covered with flowers and fruits, and lastly the extremity which is covered with leaves and which will produce the following year, flower or fruit. Besides you perceive that the bark of the branch is of a brown colour, becoming green by degrees as you approach the extremity where it is *cane-green*. These three parts are very distinct. The middling part, which flowered and gave fruits the previous year, will not flower the following year. The sap will be entirely employed in preparing shoots which are to be used another year, whilst the extremity will give flowers and fruits and produce a new scion which will give in its turn flowers and fruits.

There results from these observations, that if you direct and draw towards the fruitful productions, the sap and the juice required for the nourishment of the useless branches, you would obtain, as said above, an abundant, regular and prolonged harvest of good quality. This may be obtained by the reasonable pruning of all unproductive and glutton branches.

In principal, the primary branches give the crops. If they be too abundant, the plant is exhausted for one or two years, and produces little fruit during this time, which occurs often in flat and shady lands. In this case, you ought not to hesitate in sacrificing 6 or 8 primary branches after having manured the ground. Otherwise, the primary branches ought not to be cut, unless they may have grown considerably so as to suffocate the plant.

When the secondary branches have sprung up, those of the coffee plant of Liberia grow in course of the third year, and they must be examined one by one. If they be all left, there would promptly form a tissue of branches which would oppose the beneficent action of the air and the sun, and contribute in forming on the trunk moss and lihen very injurious to the plant. The harvest then would be either too much or there would be a number of young shoots with very little fruit. To avoid this inconvenience, every two years, cut all the secondary branches

which are at 6 inches from the trunk, then, if there be a primary branch at the same knot as many secondary branches, leave but one on each side, and be careful that the next, on the other knot, be on the side of the branch. The cutting ought to be made as close as possible to the joining of the plant.

All branch or shoot having taken an irregular direction ought to be pruned, as well as the shoots from the roots of the stem, which must never be allowed to grow.

The secondary branches produce in their turn tertiary branches, but as they are seldom used, they ought to be cut or treated like the secondary branches.

When these latter have given fruit for two consecutive years, it is good to cut them, as well as the tertiary branches, but being careful to reserve a certain number, more tender, to produce the harvest. It is the new tender shoots issues of the primary and secondary branches which produce the fruit. The coffee plant being in good condition, secondary branches will constantly be forming, and all the secret of the pruning to have regular harvest, consists in knowing to direct it, so as to have an average of fruitful branches. Some agriculturists are of opinion that the pruning of lateral branches is a mistake, because the plant is deprived of its leaves which are, as said above, the organs of respiration. It is easy then to understand that the nourishment of the plant ought not to be made with the energy necessary to the good physiologic state of the plant, in such a way that its branches failing, the movement of the sap is slower and the growth slower. Consequently the lateral branches ought to be allowed to grow and those which are too strong only to be suppressed. Besides, if some of these lateral branches, favoured by the light and by their position, acquire an extraordinary development, in absorbing the sap required for the general nourishment of the plant, the pinching ought to be used on the extremity of these branches, so as to prevent their development. Supposing this development to be too great, the branch ought to be twisted by some process, to prevent the rising of the sap, when it will occur again. The agriculturists may try the two systems to see which is the better.

As the nourishment is more effective vertically than horizontally, the sap produces often, principally when the soil contains lots of water, very long vertical branches with leaves very far apart which enter into the crown of the tree where they form sterile wood. The glutinous branches ought to be cut, the soil tilled, and manure put, at a distance more or less great from the foot of the plant.

If branches rise towards the axle of the tree in the same direction, cut them at the same time as the secondary branches.

A great number of shoots generally cover the coffee tree and do not produce fruit. Many others rise equally, in the centre of the plant, the year of the pruning, strengthen and multiply the next year, in keeping the same sterility. It must not be forgotten to separate them after the harvest.

There are years during which the coffee plants are so fruitful that they look exhausted, as is shown by a colour so pale that they seem dry. The evil does not arise from their organs. The cause resides in the earth from whence the roots draw their nourishment. In this case, it is necessary to prune more than usual the plants touched with decay and put at the same time manure at the foot of the plant.

When the plants are too aged, and give little fruit, they must be cut down 6 inches from the soil. The following year the foot of the stem will be surrounded with shoots, which must be cut, with the exception of two, chosen amongst the strongest and best formed. The third year, prune these two shoots, and you will soon get fruit. This process makes the coffee plant look younger and in fit state to produce fruit for 10 or 15 years and often longer.

There is a system referring to this question of pruning, which has been recommended by M^r. Daniel Hooibrenk, and which consists, after having pruned the plant, to give to the principal branches a direction a little above the horizontal, in the direction of 101 degrees, the straight angle being of 90 degrees. M. Hooibrenk bases his system on these principles, the curved branches draw very little nourishment from the soil, and support themselves from what they draw from the air, and render

to the trunk the surplus of the nourishment they draw from the atmosphere, so that the branches by this form receive better the influence of the rays of the sun. The trunk acquires thus a double force of growth and gains equally in intrinsic strength. The effect produced on the curved branch is not less remarkable. As soon as the sap returns to the trunk, a new life is manifested in all the buds of inactive wood of the preceding years. They recommence to flower and seem disposed to fruit.

In a greater incline, the gas or sap rises too fast and the buds placed near the trunk only receive the nourishment. In a less incline, that is in a direction altogether horizontal, the sap remains in a way stagnant and consequently is not drawn towards the trunk.

The experiments may be made in two ways, not only with the young and small coffee plants, but also with the aged. Attach strongly the lower branch to the ground or to the trunk, and then the lower branches to the top branches, so that they may have the required incline. Care should be taken to procure sufficient light and air between the plants.

The question of the necessity of manure for the lands used for the culture of coffee is one of the most important for the agriculturists. Whoever has studied agriculture knows that the plants live and develop on condition they can draw from the air or the soil, the substances necessary for their nourishment. All plants are composed essentially of carbon, oxygen, hydrogen, and azote, and contain besides different elementary principles changeable generally according to the species, amongst which may be quoted potassium, calcium, silicium, sodium, magnesia, phosphor, sulphur, iron, &c. Thus these matters must necessarily be found either in the air or in the earth from whence the plants may draw them. The plants draw principally from the air the carbon which constitutes the greater part of their organism. They draw equally from the atmosphere their oxygen and hydrogen which supply them with the water. As for the azote, they draw undoubtedly a certain proportion from the air, but this quantity is certainly insufficient. As for the mineral elements, the plants draw them all from the soil, such as the potassium

and the calcium, which is found in nearly every plant, and the phosphorous necessary to the formation of the albumen, of the fibrine and of the vegetable caseine. But all these elements do not naturally exist in every soil, and in case where the earth is wanting one or more of them, it must be added. The same necessity is felt when a plant which requires for its development, some principle, has exhausted by a lengthy cultivation the provisions of the principles which the soil contained; the latter must then be supplied with the wanting principles by means of organic or mineral manure.

After this theory, all land, which has already been cultivated, requires manure from the onset.

All new land, planted with coffee, requires equally after the second or third harvest, manure to prevent it from exhausting and to obtain a better outturn.

A plantation of coffee, in an excellent soil, gives generally, without manure, remunerative products during 10 or 12 years, but after this period the outturn will scarcely pay the expenses of cultivation, whereas by putting manure properly the property may be kept up indefinitely with a larger outturn. But it is not sufficient to supply the soil with any sort of manure, it must be well selected and well put. For this purpose, it is indispensable to know the chemical composition of the plant, the nature of the soil and of the manure you have at your disposal, as well as of those to be employed.

Therefore the intelligent agriculturists who decide to make improved cultivation, the only one practicable at present, ought to understand the importance for them to know minutely the land to be used for this cultivation, and the interest which the analysis of the coffee plant produces in its many phases as tender plant or adult plant in good state or in bad condition.

These analyses are difficult for an agriculturist: but nothing prevents having them made by professional chemists, in following the example of some agriculturists of Salvador who addressed themselves to M. Joulie, Administrator of the *Society anonyme des produits chimique agricoles de Paris*.

After a report which was published in the Diovrio de Avisos (San Salvador) on the 13th April 1881, the study, made by M. Joulie, on the young coffee plants or nursery plants, shows that during the first age of the plant, it is the action of the potash which is preponderant; afterwards it is the azote; then the lime, the kali, the phosphoric acid and lastly the magnesia.

The examination of the plant, in its complete development, makes known that the lime in it takes the principal part, then come azote, then phosphoric acid, potash, and magnesia in equal importance, and lastly the kali in small proportions.

To be able to appreciate exactly the requirements of a coffee plant, you must consider before all the production of its leaves which constitute the principal part of its annual vegetation, and which are required to supply to the plant the necessary elements for the production of the fruit.

The trunk and the branches concentrate on the contrary the produce which do not serve or serve a little to the said production. It is for this that the lime is in abundance.

The analysis of the leaves shows that, in the annual consumption, it is always the potash which comes first, then come the azote and lime.

After this the manure most suited to a soil supposed to be inert would be a manure thus composed, in taking as minimum 400 grammes as a dose for each plant:—

Phosphoric acid <i>assimilating immediately</i>	20 grammes	Weight equal to 16.9 grains avoirdupois or 15.4 grains troy.
Do. <i>assimilating slowly</i>	... 6 "	
Potash	... 56 "	
Lime	... 76 "	
Azote	... 16 "	

The potash is found in quantity nearly equivalent to the richness of the leaves. The lime exceeds nearly doubly the requirements of the plant, but as it is not very soluble, there must be this excess to assure its provision. The phosphoric acid exceeds a little that which is necessary, but it is not bad, as it is the element which favours most the production of the fruit. Lastly the azote has but the fourth of what is necessary, but the atmosphere must be looked to supply the plant with the other three fourths.

This manure, of which cost price at Salvador is 0 fr. 15 per 400 grammes per plant, is modified naturally according to the composition of the analysed lands, in reducing proportionately the dose of the elements they contain in sufficient quantities.

The use of chemical manures is indisputable. They are indispensable, but on the other hand, we believe, that they could never suffice to the necessities of a normal and productive cultivation. To wish to substitute chemical manures to natural manure says Rohart, is to wish to replace the heat of the sun by a winter temperature.

At first the price of these manures remained high up to date, then the cultivator, who fertilises exclusively his lands with chemical manures, would find himself in great trouble at a time when, by some circumstance, the use of this manure will have become difficult or impossible.

We believe equally that chemical manures would suffice for a land well cultivated and endowed with all the necessary physical qualities, to assure the harvest; but as the continued employ of these manures would end by taking from the soil its old fertility, and that, as the lands are far from possessing all the necessary physical qualities, it would be prudent for the proprietor to use chemical manure as complement of the natural manures, then they would be of the greatest utility to obtain the maximum of the production.

Among the natural manures, preference should be given to those which exercise the most influence on the coffee plant. The stimulating manures would produce a number of secondary branches and cross shoots hurtful to the plant. It would be preferable to employ those which form vigorous branches and give an abundant harvest.

The animal manure is good, but it ought to be used with discretion and never when it is fresh, whereas it is advantageous when well prepared. Bones, burnt, ground or decomposed by the action of phosphoric acid, make an excellent manure.

At Liberia, very little manure is used up to the present, the plantations being still fresh. The manure most employed is composed of pulp of coffee mixed with animal manure, or of

rotten vegetable manure, of grass, wood, ashes, &c., this coffee plant, according to the reports of the planters of Liberia, prefers the azotal manures and presents the advantage of receiving more easily the influence of the manure, owing to the tendency of the roots remaining on the surface of the soil. They recommend also, for the lands composed of clay and silex, the lime as furnishing to the soil an indispensable principle, and *desagregeant* the potash of the elements with which it is combined.

The choice and application of the organic or mineral manures depends on the physical constituents of the lands according to the analysis.

As regards the expenses necessitated by the use of these manures, it would be a great mistake on the part of the agriculturists to deprive themselves of its benefits under an economical pretext.

It is known by all competent men, that a plantation of coffee in a land already exhausted and without manure, will not produce annually more than 3 or 4 ounces per plant. In a young and cultivated land without manure the outturn does not exceed a half or one pound maximum, one year and another and during a limited time; whereas a coffee plant well cultivated and to which the required manure will have been given, will give from 3 to 4 pounds of coffee per plant during a limited time.

It is seen by this; the immense advantage there is for an agriculturist to use manures, whatever be the cost price, which can never be excessive, if he knows how to employ the animal and vegetable substances which may be used as manure in a property of certain extent.

The principal care required by the coffee plants, during their development, consist in maintaining them as clean as possible so as to guarantee them from the absorbtion of the herbs which grow spontaneously in great quantity in the rich lands of warm climates. These cleansings are the same for the coffee of Arabia. It is for this we will say nothing further. We will also say nothing about the numerous diseases to which the plantations of coffee are subject, space not permitting. We will only re-

mark that up to the present, the coffee plant of Liberia, has resisted better, than that of Arabia, the attacks of *Hemileya vastatrix*, of *Cemiostoma Coffeellum*, and to the other enemies of these useful plants. The harvest of the coffee of Liberia ought to be made by degrees as the seeds attain maturity and not when the majority are ripe. Otherwise the flowering might be delayed. Whereas by this method the plant has the time of reconstituting for itself new sap for the following flowering.

If you wait till the majority of the fruits be ripe to make the harvest, you would commit a mistake which is one of the causes of the irregularity of the harvests, principally when the plants have attained a certain age. The fruit ought to be plucked when the cherry being of a dark red colour is tender to the touch. Of course in dividing thus the harvest there would be an increase of expenditure and a considerable time required, but it is necessary to regulate the harvests and obtain good coffee.

The plucking ought to be made with the hand, care being taken not to destroy the fruiting branches, not to cause the falling of the leaves at the extremities of the branches, and not to destroy the buds which will flower afterwards, which would diminish considerably the following harvest. After strong and abundant rains, it may happen that the seeds become empty and of a dark red colour. These seeds ought not to be mixed with the others.

When dry weather sets in a month before the harvest, the seeds change from yellow to black and wither, it is better then to pluck them; the following harvest will compensate the loss sustained.

Very often the seed of Arabia, after plentiful rain or owing to excess of production or want of nourishing substances, fall to the ground. This inconvenience is not to be feared with the coffee of Liberia whose peduncle is very short and very strong. We will not speak of the desiccation or of the other operations required by the coffee of Liberia before arriving at the market, these operations being the same as for the coffee of Arabia. The unique difficulty in the coffee of Liberia is the removing of the pulp, but this difficulty does not exist any more since

the discovery of a special machine invented by M. M. Morris, of Philadelphia.

The planters of Liberia recommend to leave it two years in the red shell before breaking it and attending to other operations.

The coffee of Liberia is still nearly unknown in the foreign markets, other than those of the United States. It must also be said that its production is very small, does not exceed 5 or 6 millions pounds per year, and that its preparation is very imperfect. The precious plant is cultivated by the negroes without any method. Each family possesses a certain number of coffee plants, which they allow to grow by themselves without troubling themselves as to the outturn it gives. The climate being rather unhealthy, few strangers have settled down up to date in the country. However, near Mouravia and on the borders of the Mesurado, there exists some coffee cultivation where it is more advanced.

The small quantity exported annually from the Republic is sent to the United States, principally in Philadelphia, where till 1874, its price did not exceed 14 centimes per pound. But at this period, thanks to the efforts of M. M. Edward, L. Morris, & Co., and other friends of the Republic to make known and develop the use of this new variety of coffee, the demands became more numerous and the prices having increased from 18 to 22 centimes remained so until the last general fall. Besides, you may say that the quantity of coffee of Liberia, which came on the markets of the United States, has been too small to exercise any influence.

Some samples lately sold in the market of London at the prices of 102 to 106 shillings the 100 pounds, caused on the part of the British trade journal the following remarks:—

“A certain interest has been excited by the appearance, in the London produce market, of a new variety of coffee (*Coffea Liberia*) which has attracted the attention of commercial men for some time. It is not absolutely a new produce, some lots which were exposed, from time to time in the market of London, during these last ten years, disappeared and probably caused a loss to the senders of Liberia. Whatever it be, you may judge

by these samples that this coffee has been very imperfectly prepared by the Liberians. However, that which is exported to the United States and which constitutes nearly all the exportation of the Republic has been approved and obtained high prices.

"In future, it is probable that a certain quantity of this coffee will be despatched to England, and, as it is already appreciated by the planters of India, Ceylon, and of other countries, it is believed that in a few years, this coffee will compete seriously with the other sorts in the markets.

"It is always difficult to estimate the intrinsic value of a produce comparatively new, and mistakes may be made regarding the cost price. We have heard that lots of this coffee have been sold, either by auction, or by private contracts at prices from 102 to 106 shillings the 100 pounds. These prices which are more fancy prices, do not represent its real value, and competent merchants believe that the coffees of Liberia will be quoted, in time, equal to Java and to native qualities (nativo descriptions) at 90 shillings per cwt. It is possible that the cultivation of this variety, made in the required climatic conditions, may be fatal one day to the coffee of Arabia."

Referring to a communication addressed by a house of New York to the *Ceylon Times*, a certain quantity of Liberian coffee has been sold at Philadelphia at 18 to 22 contimes the pound.

Herewith now the decision of a certain number of merchants and planters called lately in London to give their opinion on the qualities of the coffee of Liberia and on its commercial value. "This coffee possesses qualities unknown up to date, and when its cultivation and preparation will be more advanced, it will be a dangerous rival to the coffee of Arabia. We have found that you may obtain from its torrefaction and its infusion, an aroma as strong as agreeable, when the seed has been kept at least two years in its red shell before being opened. We are of opinion that the cultivation of this coffee is called to play an important part and that its consumption will increase considerably when the general taste will be accustomed to its stronger aroma, but less tasty to that of the coffee of Ceylon and to the native plantations.

In short, the coffee plant of Liberia, by its precocity, by its production, by the quality of its fruit, by its commercial value, by the resistance it offers to the numerous enemies to which are exposed the precious plant, and lastly, by the property it possesses to be cultivated in the plains as well as on the declivity of hills, is worthy of the attention of the planters of tropical countries, of the merchants and amateurs of coffee. Already it has been introduced in a great number of countries where it has succeeded admirably, to the satisfaction of the planters, who from day to day appreciate it more, especially those of Ceylon.

The first seeds imported in Ceylon in 1874, were got from the Botanical Garden of Kew (England.) It was afterwards procured directly from Liberia, and some planters addressed themselves to M. M. W. Bull of Chelsea, Irvine Christy & Co. of Liverpool, E. S. Morris & Co. of Philadelphia, who up to date with the eminent director of the royal establishment of Kew, have mostly contributed to the propagation and distribution of this useful plant. Now-a-days in Ceylon, more than 600 acres are used in this cultivation, of which the *Ceylon Observer* spoke in these terms in the month of September 1880."

"Young and old planters, men of phlegmatic and sanguine temperament, all seem profoundly impressed at the great success obtained by the coffee of Liberia in the Isle Ceylon. From all sides, we hear remarks of the magnificent harvests and of the prospects still more brilliant. The growth of the plant in many cases is really astonishing as well as the abundance of the produce at Mourovia (Galle) at Kalutara, Putupanlakandi, Wellamaya, Liberia, Indoypala, Polgochamerela ; in a word, the harvests, in all the island, give great hopes. The demand of the planters, who wish to have the seeds collected in the country, cannot be met. But in the season 1880-81 their demands may be satisfied, and a certain quantity of the new coffee may be exported ; first step of a commerce which will continue increasing till the Liberian Ceylon be known in Mincing Lane, as much as the middling plantation and the good ordinary native coffee. The planters of Ceylon appreciate more so the coffee plant of Liberia because up to the present it has been able to resist

the attacks of the *Hemileya vastatrix* which since 1869-70 has caused a loss of more than 379 millions of francs."

In a letter addressed to the Secretary of the Horticultural Society of Madras, Dr. Bidie speaks in these terms of the prospect of the coffee of Liberia in India, where its cultivation has been introduced on a pretty large scale. •

" Since a long time, I am studying the coffee plant of Liberia and after the notes I have taken on the habit of the plant, on the geographical position and on the climate of its country of origin, I am convinced that it would succeed perfectly in certain parts of British India, and would one day supply the largest produce for exportation."•

In Western British India, the coffee plant of Liberia has gained favour with the planters who besides having the advantage of cultivating it in the plains at a small altitude, have seen that the numerous enemies of the coffee plant of Arabia, amongst others, the terrible *Cemiostoma Coffeellum* could cause it insignificant damages up to now. It was in 1874, that the first seeds of the coffee of Liberia were sent from Kew to Jamaica, Domenigen, Mountserrat, Trinidad, and Granada. Now-a-days its cultivation has extended in nearly all the *Antilles du Vent and Sous-lé-Vent* where each day it makes new progress.

Sometime ago trials of this same cultivation have been attempted in Central America, principally in the States of Costa Rica and Nicaragua. Herewith what has been said, by M. Adam Cardenas, Minister of the Fomento of this latter Republic, in his annual report to the Congress of 1881 : " the knowledge acquired, that the coffee of Arabia, which succeeds well in the whole extent of our territory, requires to give good harvests, an altitude of more than 2,000 feet, determined the Government to introduce in the country seeds of the coffee of Liberia, for experiments in the fertile lands of the coast in the low lands. The seeds have been distributed in some departments, amongst different planters, and by the information received, we know that although the seeds did not reach in good condition, the few that germinated have grown and developed with great strength; It is hoped that when the practical advantages of this variety

will be known, our agriculturists will ask for the necessary seeds to derive advantage from their rich lands. In the meantime, we ought we think to communicate to the Congress the following information which has been addressed on the subject of this interesting question, to the Prefect of Rivas by M. Don Pedro Chamorro, one of the most intelligent agriculturists of the Republic.

"M. l'Acade No. 2.—I received the copy of the note which the Prefect wrote to you to ask you the information on the results obtained with the seeds of the coffee of Liberia, which were distributed in the month of July 1879 amongst many agriculturists of the town.

"Of the nineteen seeds I received, four only germinated, amongst which one died. Of the three others, one sprung up in the beginning of September, the second in the middle, and the third at the end of the same month, they are in good condition.

The precocity of these two latter seeds has been such that it could not be surpassed even in the country of its origin, the two plants which have grown in my garden, when I took every possible care of them, have been taken to the nursery which I have in my *hacienda* of San-Antonio. Since then, their development has been surprising, the leaves measured at first from 9 to 10 inches, but those which have grown afterwards had $13\frac{1}{2}$ inches in length or $6\frac{1}{2}$ inches breadth. At the height of one metre, the two first lateral branches appeared, the trunk continued to grow vertically and having attained 7 inches more, produced new branches, and shortly after, in the same proportions, the third branches, so that they are already 46 English inches in height, the colour of these branches is of a dark green, very brilliant which strikes the eyes, in the middle of the coffee plants of Arabia, although these are in a magnificent condition.

The other plant which I keep in my garden is but 15 inches high, without lateral branches. Long time after its birth, it remained stunted, with numerous small bushy leaves. I took care to cut away a part to keep the delicate stem clean and to warm it. I transplanted it to the *hacienda* in a box filled with vegetable earth, at the same time as the other plants; it

was then 4 inches, so that in four months its growth was more than 11 inches, and it showed during this time the same vigour the same freshness, and the same brightness as its *congenères*. Leaving aside the extraordinary precocity of the others, this latter shows distinctly what may be expected from the cultivation of this African family in our tropical country.

"I would add that the seeds brought in this town reached in bad condition, and that if Government desire fresh supplies, I would be happy to indicate if agreeable the preparations I use to get good seeds, an operation which would allow to economise thus the $\frac{3}{4}$ of transport and thus gain 80 per cent. on the seed."

This information is doubly interesting, it confirms what we said above on the subject of the precocity of the coffee of Liberia and shows the facility with which it may be acclimatized, provided the seed be good, which is one of the indispensable conditions if you wish to succeed.

The cultivation of the coffee plant of Liberia was introduced in the royal gardens of Kew (England) in 1872, and it is to this establishment that the world owes in a great measure the propagation of this precious plant. Its eminent direction showed such intelligence and ability to obtain and distribute this new produce to the persons requiring it, that after a short space of time it was distributed from Brazil to Burmah, from Jamaica to Ceylon, and from Calcutta to Queensland. Other establishments took charge afterwards with great zeal and energy, to propagate and distribute the coffee of Liberia, amongst them we mention, in Europe, M. M. W. Bull of Chelsea, M. M. Irvine-Christy of Liverpool, and in America, the house of Morris & Co., of Philadelphia, as well as the botanical gardens of Jamaica and Trinidad. The number of Ward cases sent for some time by these establishments is considerable.

We ignore what has been done on this subject in our possessions of *d'outre-mer* which possess the conditions of climate and soil required for this cultivation. Any how we are convinced, as member of the *Société d'acclimatation* of France, that there does not exist for tropical countries, a more abundant source of riches than this cultivation, and that it is in the interest of Government

as well as of private individuals to propagate it as much as possible. (*Translated from the Monthly Journal of the National Acclimation Society of France.*)

Note on the American Sumach (Dividivi) Cæsalpinia coriaria.

BY THE SECRETARY.

THE Superintendent of the garden has sent up a small quantity of seed of the American Sumach (Dividivi) *Cæsalpinia coriaria*. We have a few trees in the garden, some ten years old, about ten feet high, which bear an abundance of pods. These trees were introduced in 1872 when the piece of ground on which the garden is formed was transferred by Government to the Society.

As the subject of Dividivi has been recently attracting attention for its value as a tan-yielder, and as probably very few members of our Society (in this most fluctuating Indian community) are old enough to remember its proceedings in bye gone years, it may be alike interesting and useful to reproduce a few particulars connected with this tree and its valuable products.

I now place on the table a bottle from our Museum containing pods of Dividivi which were presented to this Society by one of its former most zealous Members, Dr. Wallich, a Vice-President, and then Superintendent of the H. C. Botanic Garden. (Here I may be allowed to remark, by way of parenthesis, that a reader of the publications of this Society of former years cannot fail to be struck with the amount of information communicated by Dr. Wallich. Scarcely a month passed without some useful paper or note from his pen, the result of his voluminous correspondence throughout India in connection with his position as Superintendent of the Botanic Garden. Following closely in the footsteps of his eminent predecessor, Dr. Roxburgh, he seldom

allowed an opportunity to pass of drawing attention to the useful properties of plants; and to have been ever desirous of rendering his botanical acquirements subservient to the dissemination of useful information in connection with every department of the vegetable kingdom.) From the label attached to the bottle, it will be observed, that it was presented to the Society at a Meeting in March 1845; and on turning to the records *Journal, Vol. iv, old series,*) I find full particulars relative thereto. In his first communication Dr. Wallich recommended the cultivation of the Sumach to be widely extended, as it would seem to thrive well in Bengal. In a second communication he presented some seed raised in the garden, and a note on the best mode of treating the plant, which is as follows:—

“With regard to your query about the best mode of “treating the American Sumach or “Dividivi,” I will tell you “all I know of the matter. Sow the seeds as soon as they “are ripe, because they are subject to the attack of an insect, “to a degree exceeding almost anything I have ever witnessed “even among leguminous plants, to which family our plant “belongs. The seeds should be sown in a light garden mould “mixed with sand, and rather superficially. They commence “vegetating usually in the course of one week; I have “known them come up the sixth day. When the seedlings “are of a couple of inches high, they should be carefully “planted in small pots, singly; and when they have attained “say three feet, they may be planted out in the open ground, “which ought previously to have been well trenched, and “enriched with some manure, if required. The ground must “of course be sufficiently high to be exempted from inundations of any sort. In its young state the Dividivi will “require a little shading from the too intense sun rays; but “in after years, I mean from the time it has been planted, “out, I suspect that the less shade is given the more produc-

"tive will be the return of pod. The distance between the "plants should be, at least 12 feet in the quincunx- "fashion. I should think that, during the first hot season, "the plantation may require a little irrigation in very dry "hot weather. I have a notion that the Dividivi would "form an excellent shade to coffee trees. It would be worth "while trying the experiment."

This seed was distributed to about 40 members resident in 29 distinct quarters of the country; but I cannot, unfortunately, find any record of the result. This is not surprising, for subsequent experience has proved, in respect to many newly introduced economic plants, the difficulty of obtaining any information of a reliable character; this is most disheartening and unsatisfactory. Dr. Wallich states that the tree was introduced by Dr. Hamilton, of Plymouth, into the Botanic Garden. "Our first plants," he observes—"were raised in December 1835. The first flowers were produced "in November 1837. In November 1840, the plants blos- "somed freely, and furnished some ripe pods. During this pre- "sent and last month, we have had about 12 seers weight "of pods; and I am quite sure we shall have a larger supply "next year. I suspect our trees have been shaded too much— "have been too much taken care of.

"Again and again, I recommend this Sumach to be widely "cultivated in this part of the world. I have sent seeds "to Madras, Ceylon, and Bombay, and to many places in "Hindustan. Enclosed I forward to you an additional "paper of the seeds."

When sending this seed Dr. Wallich forwarded copies of several interesting letters from Mr. John Teil, Proprietor of the Kidderpore Tannery, with specimens of leather tanned with Sumach, the produce of the Botanic Garden. They were much admired and the opinion was that "it left nothing further to be wished." It was only two years ago that I put

these specimens (14 in all) aside, the skins having become so much deteriorated by age as to be considered almost useless. I now re-produce them as curiosities. Mr. Teil reported the Sumach raised by Dr. Wallich to be "infinitely superior" "in appearance, cleanliness, beauty and essential qualities" "to the American Sumach imported by me." And he goes on to observe—"The American Sumach is brought here in "a pulverized state, and I beg to send you a small sample of "the best I have now in store; but it has not, as you will "perceive, the bright, beautiful greenish yellow color of your "Sumach, and the latter, in my opinion, leaves the other at "an immeasurable distance behind, in point of strength and "astringency. Upon tasting your Sumach I found it to be "fully as astringent as the Aleppo-Galls which I use with "babool bark in tanning *fine* skins, and I am inclined to "think that your Sumach, if it will not be superior, it will "at least be fully equal to the Aleppo-Galls for tanning ~~pure~~ "poses; while I am certain, from its appearance, that it will "impart a brighter color to the leather which may be tanned "with it; I shall, however, put it to the test immediately and "hereafter communicate the {result with all my operations for "your information."

The gold medal of the Society was awarded to Mr. Teil in the following year, (1846) in consideration of the "disinterested and useful service he has rendered, in so zealously prosecuting certain experiments on the tanning properties of the American Sumach, the produce of the H. C. Botanic Garden, as detailed in the correspondence and shewn by the specimens which have been laid before the Society by Dr. Wallich, during the last twelve months."

The whole of the papers above referred to were published by the Society in 1845-46. They are very interesting but too lengthy to be introduced in this memorandum. Now that attention is again attracted to the valuable properties of Ameri-

rican Sumach, its culture might be carried out extensively, and under more favorable circumstances. From the fact of its non-extension in Lower Bengal it may be presumed that though it grows fairly well, and is indeed an ornamental tree, it does not grow with sufficient rapidity or yield a sufficiency of pods to render it a remunerative culture. But it is just possible that in various other parts of India, especially in certain localities in the N.-W. Provinces, as a hot, sandy, and arid soil is most suitable, it may be cultivated advantageously, and is therefore deserving of notice by residents in such places.

It may be remarked, in conclusion, that the American Sumach is quite distinct from the Sicilian (Mediterranean) Sumach (*Rhus coriaria*.) The tan of the former resides in the pods, of the latter in the twigs. In Carthagena and other parts of South America, the former, it is said, blossoms the third year after planting, and perfects its pods in the following year. One pound of this pod is equal to four pounds of the best British oak bark, and tans the leather in two-thirds less time. It has also been found by analysis to contain a much larger proportion of soluble or extractive matter as also of tannin than the best Aleppo-Galls, catechu, kino or the common Sumach (Sicilian.)

NOTE.—Since the above was written I have seen some useful remarks in a recent Madras paper from which it would seem that the American Sumach is in cultivation in certain localities in that Presidency; and I add the following from a correspondent of the *Madras Mail* who, writing in November 1881, states "this plant, which grows in many of the cutlying villages of Madras, and has been up to date uncared for, is now found to be a valuable article for tanning purposes. Large quantities of the pods these plants yield are being shipped to Europe, and in fact many persons have begun to pay some attention to the cultivation of this plant. A

"consignment of 88 bags of dried pods from this plant was
"shipped to England by the *Duke of Buckingham*. 173
"trees of the Dividivi in full bearing, which would take an
"acre of land, is supposed to yield fifty cwt. of pods, which
"are valued in London at £37 10s.; and as the cultivation and
"care cost literally nothing after the trees are once in bear-
"ing, it is found to be a most profitable crop."

*Results of experimental cultivation of Kumaon Potatos in the
Darjeeling District.*

READ a letter, dated 8th September 1882, from the Secretary, Government of India, Revenue and Agricultural Department, requesting to be furnished with a report on the above potatos, of which a supply was given in February last.

• Read the following letter, dated 2nd December, from Mr. H. J. Leitch (Messrs. Lloyd & Co.) in respect to the above:

"With reference to your letter of 15th September last, enclosing one from the Department of Agriculture and Commerce, regarding the sample potatos handed to me for distribution in the Darjeeling district, I have now the honour to forward the reports I have received from the different planters in the Darjeeling district, to whom I entrusted the samples for experiment. I can only express my regret personally that the results have not been more satisfactory."

From Mr. W. Helps, Singbala, 12th November, to Mr. H. J. Leitch.—Your favour of 7th instant to hand; have written to the following gentlemen for their reports on the potatos I sent them, and immediately on receipt will forward on to you.

Mr. H. R. Irwin	...	Punkabaree	...	One bag.
„ A. E. Allies	...	Ring Tong	...	Two bags.
„ A. C. Curtis	...	Ting Ling	...	Two bags.
„ C. G. Reid	...	Murmah	...	Three bags!
„ J. C. Horn	...	Nahore	...	Two bags.

Mr. S. Smith	... Teesta Valley	... Two bags.
„ H. W. Craigie	... Gielle	... Two bags.
„ E. Ephgrave	... Selimbong	... Two bags.
„ G. F. Flamsteed	...	... 20 seers.
„ F. A. Wearing	... Ambrotia	... 20 seers.

The remainder was put down by me on land belonging to the new Fallodhi Tea Co., "Ld.," at an elevation of about 4,000 feet, with exception of about 20 seers, which I planted in my vegetable garden at an elevation of about 3,350 feet.

Owing to the lateness of the season for planting potatos in the Terai, and the receipt of your private note without date, the instructions contained in Messrs. Lloyd & Co.'s letter of 9th February last for the distribution, could not be carried out, so that in consultation with the late Mr. Forbes Hall, the within mentioned list was agreed to instead. Several wealthy natives of the district were asked to plant some of the potatos as well, but I regret to say, not one of them cared to do it, or seemed to take the slightest interest in the matter at all.

Report on Potato seed received from Messrs. Lloyd & Co., Calcutta, as per their letter of 9th February 1882.

3rd March 1882.—Planted in my vegetable garden at about an elevation of 3,350 feet, ten seers of small tubers in trenches well prepared with ashes, lime, and manure, each trench about $2\frac{1}{2}$ feet apart, and potatos sown about eight inches apart; the tubers were very small with all eyes but one picked out, nearly every one sent up vines, which grew exceedingly well, and formed good substantial looking plants, necessary earthing up was done, and when the whole of the vines had completely dried were dug up in the month of July, result being only 20 seers of a very poor, indifferent and small potatos; any number of the vine roots being taken up, without the slightest sign of a tuber having been formed. Red ants very destructive.

Planted in my vegetable garden at the above elevation ten seers of the largest size tubers cut into four and five pieces, put into well dug deep trenches, manured last year with cow-dung, and in which nothing had been grown since it was manured, soil was beautifully prepared, pulverized, and forked deep to about one and a half feet; dug up in July, result about thirty seers, not one of the tubers being equal in size to what were planted, as with the small ones, any number of the vine roots, not having the slightest sign of a formation on them whether from having been in a very young state destroyed by red ants or not, I am unable to say, but I find them (red ants) very destructive up at this elevation, and do all I can, I cannot rid the place of them, for I have burnt the soil, used ashes and lime to a great extent and still of no very great beneficial avail. March 4th, 5th, 7th, 8th, 9th and 10th, planted nine maunds one seer at an elevation of about 4,000 feet putting some down whole, some cut into four and five pieces, and some treated as the small tubers were planted on the 3rd in my vegetable garden. The land selected had not been cultivated for some six years past, a rich red looking soil, cut the jungle on it first and allowed to dry, then fired it for the ash, deep hoed it once, and then sprinkling well with lime, forked it deep, taking out all roots, stones, &c., and pulverizing the soil as much as possible, planting the potatos on drills as is the native custom up in the district, earthing up as well and not a weed allowed to grow, for one coolie was kept constantly on the field for this purpose, and also to protect it from being robbed at night; it was strongly fenced round also, to keep animals and cattle out, and I should say the land planted out was from $\frac{1}{4}$ to an acre in extent. On being dug up in September, many tubers were found to be half rotten, and many more had thrown out new vines four to five inches long, this I am inclined to think shews that the elevation there is not suited for potato grow-

66 *Results of experimental cultivation of Kumaon, &c.*

rotted. I have planted another crop just at the close of the rains, and I think they should do well.

*From Mr. S. Smith, dated Teesta Valley Tea Company, " Limited," Darjeeling, 21st November 1882.—*In reply to yours of the 10th instant, regarding the seed potatos which I received through you, I beg to state that I planted out some of both kinds on the day after their arrival (the 23rd February), this seems to have been too late in the season for this place; the weather by the time the potatos shewed above ground, had become pretty hot causing too rapid growth. The stems produced were enormous in size and the tubers were both large and abundant, but the rains were on us before they were ripe, so that on digging up a plant, only about one-third of the tubers were fit for use, the larger ones were rotten and the smaller unripe. I have no doubt had they been planted from six to eight weeks earlier they would have been an enormous crop.

On one plant (the white kind) I counted no fewer than 66 tubers, the average return was about ten times, but had they been ready before the rains set in it would have been nearer twenty.

The quality of those fit for use was excellent.

Resolved—That the best thanks of the Society be given to Mr. Leitch for the trouble so kindly taken towards this trial.

Vines of Cochin China of tuberous roots.

(Letters of Mr. Martin, Head Gardener of the Government of Saigon, to Messrs. Vilmorin Andrieux & Co. of Paris.)

*5th January, 1882.—*I took the necessary measures to send you the tubercles and the remaining seeds of the vines of Cochin China. The wine produced by this species is not very strong; and scarcely contains five degrees per hundred of

alcohol, which is not much, but in cultivating the vine it is probable that its products would be increased. The culture would not be difficult; this vine being suited to nearly every soil. It would be necessary to cultivate it in like manner as the hop, with perches to enable it to climb. I do not think it grows as large in France as in Cochin China; there are plants here that have grown higher than 50 metres, and which are covered with fruits from the bottom to the top of the creeper. The wine it produces, is of a fine colour, but it is unseasoned, which is probably due to the want of *calcaire* of the grounds of Cochin China, of which I have a proof by the following experiment:—

I put a little lime at the foot of some of the plants, and it was sufficient to make the grapes very much sweeter and even good, and the wine produced thereby was much richer, of a degree which it is not when made with grapes taken in the wild state.

This cissus can therefore, I believe, be of great utility. To effect its plantation, it is required to till the ground and make a good trench in a way that the extremity of the plant be at 8 or 10 centimetres lower than the surface of the soil, so as that, when the shoots grow from the ground, they may be able to make a hedge at the extremity of the old plants. If these were on a level with the soil, they could not develope roots, which would hinder the vegetation.

With the exception of very damp soils, nearly all agree with this vine. Clay and pebbly soils would not be a hindrance, and would not be hurtful to the plants placed in its neighbourhood. The vine thrives perfectly also in the shady places of forests. It could therefore be cultivated on trellis in form of cradle. If planted on a line, these ought to be at a distance of 1m. 50, and the plants placed at one metre the one from the other on each line.

3rd February, 1882.—I received on the 31st January your letter regarding the vines of Cochin China, and I sent you by the last mail a new lot of seeds of the year, as also a certain quantity of tubercles. I will bring some more in arriving in France the next month.

The following is what I can tell you of the vine of Cochin China :—

I found this *cissus* the first time in the month of September 1872, in the forests of the *Mois*, (I was ignorant of its existence) covered with bunches of enormous raisins. The idea struck me of making wine and the result seemed satisfactory. I had it tasted by many persons and it was not found very bad, but I was told that it would not keep, and there it remained. The following year I converted it into very good vinegar. "

But in 1879, after all I had heard said in the papers of the vine of Soudan, I tried again to make wine; unfortunately the season was rather far advanced, and I was unable to procure a sufficient quantity of fruits. I had to postpone my experiments to the following year.

In all the forests of the east this *cissus* is found in large quantities, and even in the dry parts of the districts of Havink, Hatien, Rachgia, in the Cape of St. Jacques, in all the surrounding islands of Cochin China, in the *Mois*, and all *Camboge*. I found one of a variety of white; it is the same with the red, there are many varieties. After the description given by Mr. Leecard of the tuberous annual vine which he found in *Soudan*, and after all the particulars he gives, I find that his vine was the only one which thrives in our Colony; I took therefore the necessary measures to bring tubercles into the Botanical Gardens. I put also into execution the idea I had formed of making wine in sufficiently large quantity.

On the 1st of last September, I put into vats a hundred kilos of grapes half-ripe which produced a coloured wine, but

which smelt acid; this wine showed a tendency to ferment but I succeeded in checking this unrequired fermentation, and a quality of wine presented to the Governor enabled him to appreciate the result I quote as wonderful. I had it analyzed, the wine would be pretty good, but it contains but very little alcohol.

On the 28th of the same month I commenced my trials, but unfortunately my work made me neglect it. One of the vats had raisins which were not very ripe and unsorted, they fermented and I obtained very good vinegar which I gave to a number of my friends. As regards the vat containing ripe and sorted raisin, I crushed the raisins and the fermentation set in with great rapidity. At the end of 48 hours the upper part of the vintage turned sour, the fermentation lessened, and the juice was clear, of a nice taste though a little sweet; I had a *mist* which was of very good quality.

It was needless thinking of mixing anew the pulp with liquid, or to leave the fermentation to continue in the vat, as it would have been aiding the sourness. I decided to draw and to leave it to ferment in the air. All was well for two days; the sweetness diminished and the alcohol increased; but the third day in the morning the fermentation looked troubled, and the smell was changing disagreeably; I found myself in the presence of a phenomenon which showed itself the first time, and which I was able to stop, thanks to the heating to 55° (system Sastur.) I had recourse to the same system and the wine was drinkable; it is still very good and well preserved; it contains but little alcohol about 5° which is due to the fermentation. I will send you by the next mail a sample of the wine.

You do not ignore gentlemen, that fermentation exists in the atmosphere in a state of germ, which settles itself on the exterior parts of the plants of which it transforms the juice, if favourable circumstances present themselves. As regards

the grapes, there are many microscopical substances, there is first the *Mycorderma vini* and *aceti*, and secondly, two or three other *Cryptogames* very small which constitute the disease of the vines. If the constitution of the centre influences on the development of a certain germ, the temperature of the fermentable juice helps the one instead of the other.

In France during the vintage, the temperature seldom exceeds 20° during the day and falls often to seven or eight in the night, the cellars are always very cool. Under these conditions, very favourable to the germination and to the reproduction of the *Mycorderma vini*, it generally develops itself; except at times a little *Mycorderma aceti* on the upper part of the vats if the air is troubled and consequently oxygen in the contact of the juice in fermentation. The transformation into alcohol is made slowly and regularly; and then the time arrives that the racking, the continued sizing cause the majority of the injurious germs to disappear which were mixed up with the liquids in circumstances favourable to their evolution. The fermentation of the wine has therefore ample time to produce itself, and the wine maker has, on his side, the means to check all previous mishaps.

In Cochin China, at the time I was experimenting, the temperature of the vintage always remained about 28 to 30°: notwithstanding the fermentation of the wine being superior as a rule in rapidity to the fermentation, which I would call hydrocarbonique, the wine produced in conditions nearly normal.

I planted this vine in 1872, and I would remark that the culture and the cleaning improved it; the grape becomes larger, sweeter and more juicy. The seeds of the plants, as produced in Cochin China, without human help, contain it is true, a larger quantity of solid matter in the fluid parts or susceptible to become such, but the vine of the hedges you

meet with at each step in the wine producing countries, produces a fruit much smaller and less juicy than its sisters of Cochin China. I remarked that the grapes in cluster along the creeper numbering often more than 30 are irregular in degree of maturity and in size; in limiting and sorting the grapes, you often get a marked amelioration. In admitting, what I am certain of, that success crowns the efforts of those who devote themselves to this work, a brilliant future may be seen in the countries ransacked by the *phylloxera*. I trust that the vine growers will approve my ideas and make experiments which may endow France with a culture as advantageous as it is easy.

I planted in 1872 many plants of vine of Cochin China simply to see if the culture could improve it, and I had splendid raisins the second year, much sweeter than when in a neglected state. The following year I had it cleaned, and I had raisins weighing more than two kilos. I left but about 15 to each plant.

This vine shoots up the first time in Cochin China in the months of March and April, and the first flowers appear at the end of March or beginning of April; the first fruits ripen in the beginning of September and the maturity continues till the end of November. These creepers produce large bunches of 20 metres in length covered with enormous raisins. The grounds most suited are those that are light and fresh, although I have found vines in very dry grounds where they were covered with beautiful raisins, but their bunches were then much smaller. Swampy or inundated grounds are not suited. However it cannot be said that the plant requires any particular ground since it grows in fresh as well as dry lands. It grows in all grounds in Cochin China with the exception of swampy grounds which are inundated during six months of the year.

It produces very large tubercles, and by this means it is required to cultivate it on perches, as is done for the white

wine in certain parts of France, in placing these perches at least one metre a part in all direction.

It generally produces 200 bunches on each plant. The fruits are seen as soon as the shoots appear. Once the fruits appear, the vine may be nipped, for it produces fruit to the extremity of the creeper. I cannot give you all the particulars I should have desired, or in a more detailed manner, as I am in a hurry for the mail.

*Note on the Muddar or Ak. (*Calotropis Hamiltonii.*)*

BY THE SECRETARY.

IN the Report on the Kew gardens for 1851, just to hand, there is a short notice regarding "Muddar Cotton" in connection with Mr. Liotard's "Memo. on materials in India, "suitable for the manufacture of paper." Allusion is made in that Memo. to attempts of Messrs. Thresher and Glenny of London, to turn this substance to account mixed with ordinary cotton in the manufacture of articles of clothing. Sir Joseph Hooker reports that he had applied to Messrs. Thresher on the subject, who stated, in reply, that they had "made a number of experiments with muddar floss, but "owing to the shortness of the fibre they were all unsuccessful. "We then tried to mix it with American Cotton, but "in consequence of the failing we have named, and its extreme "lightness, the muddar floss was blown away in the operation, "and we were forced to the conclusion that for our purpose "it was practically useless."

As attention is being re-directed to this common jungly plant and its properties, it may not be out of place to mention that it first attracted the attention of this Society more than 30 years ago. Mr. E. H. C. Monckton, of the Civil Service, submitted in 1849, an interesting note on "the manufacture of cloth and paper from the downy substance contained in the follicles of

the muddar." The specimens forwarded by Mr. M. in illustration of his paper are now placed on the table. They were made in the Etawah Jail. The following is a short extract from the note:—

"The muddar, it is well known, grows all over India: it seems to thrive in soils that either reject or destroy every thing else. It is difficult to conceive any thing less productive than dry sand, and yet the muddar thrives in it. Should its cotton be found useful, the waste lands of India could be covered with it, as it requires no culture and no water; it is also more productive than the common cotton plant, it comes to maturity in a year, and is perennial: so that once planted or sown, it is almost everlasting, at least for the purposes for which it is required. That it might where thickly planted, be made the means of reclaiming poor soils, I have little doubt. The leaves and mostly the upper branches, rot in the rainy season, while the root and stem remains, so that the soil in a few years would be much enriched by the decayed matter; where it was an object to cultivate land occupied by muddar, the plant might be burned and the ashes would act as a manure, and in places where wood was scarce the dried plant would make a good substitute for it."

Three years after the publication of Mr. Monkton's paper, namely, in 1852, another Member of the Society, (and in his day a most useful and energetic Member,) Major G. E. Hollings, Deputy Commissioner of the District of Leia, in the Punjab, submitted fibrous specimens prepared from the same plant which were well reported on by the Special Committee, as possessing more of the nature of flax than most of the fibrous substances in India. For several subsequent years, Major Hollings perseveringly continued to bring to notice other useful properties of the muddar, especially the juice as a possible substitute for gutta percha and the floss. At a Meeting of the Society in March 1856, the subject of the

muddar plant and its useful properties was again introduced. Though rather lengthy, I am tempted to reproduce the following extract :—" A subject that occupied the attention of the Meeting held on the 11th August 1856, was the various useful products afforded by the muddar plant (*Calotropis gigantea*.) as exemplified, more especially, by certain carpets placed on the table which had been manufactured with the downy filament contained in the follicle or seed pod ; of that plant. Major Hollings, the donor of these carpets, who was present at the Meeting, mentioned that the manipulation of the floss is precisely the same as of cotton ; the thread is not so strong, but it appears to take colour just as easily."

These carpets, Major Hollings stated, "had been made by the prisoners in the Jail at Shahpore, in the Punjab, they had unfortunately reached Calcutta in a damaged state ; but if the finest Cashmere Shawls or richest silks had been exposed as they had been, he doubted if the colours would present a better appearance than those in these carpets. To prove that the floss will retain colours, the small specimens (also placed on the table) which were presented by him to the Society in November, 1854, bore ample testimony ; but Major Hollings thought that a good mordant was still required. It was generally expected in India, that when attention was first attracted to a new product complete specimens should at once be produced. When the small wild esculent root was first introduced into England, no one anticipated that by cultivation it would become such an excellent and useful vegetable as the potato now is. The tiny pods of the wild cotton shrub were very different from the magnificent full bolls of the American plant. Major Hollings added, he had not given up his expectation of seeing the fibre from the muddar extensively used ; and if, without laying out any large sums, persons interested in the introduction of a new product, would adopt the suggestion made some time ago by

Colonel Tremenheere, of the Bengal Engineers, to cultivate the muddar as a hedge plant, or on waste lands, we should be able to determine, in a very few years, if any good or useful product could be made in sufficient quantity to form a staple of export trade. Major Hollings stated that the two larger carpets, measuring 7 feet by $3\frac{1}{2}$, cost from Rs. 6 to 7 each, and the three smaller ones, measuring 2 feet square, Rs. 2 each, and he concluded by observing, that every member of the Society could judge for himself whether, if such articles could be made by the prisoners in a Punjab Jail, much superior ones ought not to be produced if the material were subjected to the perfect manipulation of Europe, and the complete process of chemistry."

Major Hollings referred, moreover, to the wood of the muddar as well suited for charcoal for gunpowder manufacture. As his note recapitulates the useful properties of the plant, I give a long extract from it :—" It may be as well to state the result of all attempts that have been made to utilize the muddar, and the products obtained therefrom. Before any attempts had been made by Europeans to ascertain its properties, the natives had extracted medicines from the roots, and use the milk as a poison ; in the Punjab it was applied to the nurse's breast, and found an efficient means of ensuring the death of female children—the smallest portion imbibed with the milk being sufficient for the purpose, the large roots were hollowed out to form the lower portion of the musical instrument called a *sitar*, including the sounding board. In some parts of the country twine was made from the fibre. The leaves are soaked in water, and used for tanning in many parts of the Punjab. The wood converted into charcoal was used in the manufacture of gunpowder.

The Journal of the Agricultural and Horticultural Society records the manufacture of fine cloth from the cotton formed round the seed. 2, The preparation of thread, twine, rope, and

coarse cloth from the fibre in a series of experiments made with the object of ascertaining how far the product could be used as a substitute for hemp or flax. 3, The preparation of a substance from the milk as an equivalent for gutta percha. The qualities of the wood and their value of producing illuminating gas remain to be ascertained. With so many valuable properties, it will be strange if we do not soon learn to utilize the muddar, which has hitherto been thought so little of."

The floss, I may add in conclusion, has also been tried for covering hats as a substitute for silk, but has not been found to answer, so I was informed, a short time ago, by one of the most eminent hatters in London.

Certain specimens of cloth, &c., presented by Captain Hollings, referred to in the above extracts, are in the Society's Museum, and in a good state of preservation.

February 1883.

Note on the Mohwa tree, its products, uses and manner of preparation. By C. F. MANSON, Esq., Deputy Collector and Deputy Magistrate, Nya Doomka.

[IN introducing to the readers of the Journal the following interesting and useful paper of Mr. Manson, we would take the opportunity of stating, in reference to the second portion treating on the oil obtained from the seed of the Mohwa, that when attention was first drawn many years ago by the Society to the numerous useful oils obtainable throughout the length and breadth of this vast empire, that of the Mohwa was included. The Society's Museum possesses specimens which were contributed so long since as 1845 by a zealous Member and Correspondent, Mr. C. B. Taylor, who directed particular attention to the various properties of the Mohwa. As the numbers of the Journal in which Mr. Taylor's notes

appeared are probably out of print, it has been deemed desirable to reproduce them as an appendix to Mr. Manson's paper, as also a valuable report on samples sent to the London Society of Arts. The attention of a merchant of this city was attracted to the oil by the publication of this report, and he made a shipment of it to London, which proved so pecuniarily successful, that he continued it for several consecutive years at the rate of about four thousand maunds annually. The price was afterwards found to be prohibitory owing to the large demand for it for local industries. The writer of this note had an opportunity, just 30 years ago, of seeing some candles made from this oil at the extensive establishment of Messrs. Price & Co., Belmont Works, Vauxhall, London.]

This tree *Bassia latifolia* (family, Sapotaceæ or Soap-worts), is economically the most useful of all our forest trees, as its timber, flowers, and seed are all made great use of. Its vernacular names in this district are, Beng. Mohwa, Hind. Mahul, and Sontali, Matkom. It is not a very pretty tree, but it is picturesque, it has a sort of honest shaggy appearance, a good massive trunk, with a rough cracked bark, branches twisting, and crooked in all directions, with various shaped knobs as though a branch had commenced growing there and then thinking better of it had stopped, and a pretty dense foliage of rough crumpled leaves. A few giants of the forest reach a girth of 12 to 15 feet, and a height of 50 feet, but the average tree is not more than six to eight feet in girth with a height of 35 to 40 feet.

Next to the *Sil* or *Sakwa* (*Shorea robusta*), the *Mohwa* is, I think, the most common large tree in the Sontal Parganahs, and certainly the most noticeable, as it is most carefully preserved by both *Zemindar* and *Ryot* (landlord and tenant), by the first for its timber, and by the second for its flowers and seed; for by the custom of the country the produce of all forest fruit bearing trees is enjoyable by the ryot free of rent, but the trees themselves are the property of the

Zemindar. It is to be found on nearly all lands reserved for pasture, and in the rice fields where no other trees are allowed to grow.

The distinctive trees of the Bhaugulpur Hills are given in the old Hill reports as the Sâl and Palas (*Butea frondosa*). The latter, however, is seldom a large tree and unless in blossom is little noticeable except when preserved in large groves for cultivation of lac, when the mass of dark foliage attracts one's attention. It is curious that the *Mohwa* should have escaped notice.

Mohwa wood is of a bright reddish hue, extremely hard, with a very twisted knotty grain, it is mostly used for all kinds of building purposes, for door and window frames and is especially good for posts, as white ants (termites) find it too much even for their sharp nippers; it is not good for door panels, furniture or any light work owing to its weight, brittleness, and liability to crack when cut in thin pieces; but for all heavy work it is a most valuable timber, it lasts exceptionally well in water as bridge piles, is used for oil and sugarcane presses, and for the wheels of the Sontal cart (*Ságár*), or for any other massive work, and its crooked branches supply the *ryot* with the principal part of his plough (*har*), although for this purpose it is not so good as some other woods, as the sharpened point holding the share is apt to chip off if it meets a sharp corner of a stone; the *khend* (ebony, *Diospyros melanoxylon*) is particularly well adapted for this purpose, as its close hard grain only scratches, but it is much less plentiful than the *mohwa*, and has not the same expansive growth of branches.

The value of the *mohwa*, and in fact of all trees, has greatly increased in the Sontal Parganahs within the last ten years, since the *Zemindars* have been persuaded to preserve the timber on their estates, but eventually the result must be to make good timber more plentiful and cheaper; formerly a *mohwa* tree could be had for one or two rupees (two to four

shillings); but now the price is from rupees five upwards for a tree that has died; a live tree is scarcely to be had.

For burning purposes the wood is excellent, as if well dried it burns brightly with but little smoke, leaving little ash, and does not burn too fast, it also yields a first class charcoal.

The leaves are eaten by sheep, goats, and cattle, but not in great quantity owing to the amount of milky gum contained in them, which adheres to the mouth.

What the tree is most famed for is the *mohwa* flower. From this is distilled by far the greater portion of spirits consumed by the natives of Behar (Commissionership of Patna, with part of Bhaugulpur) to which province the northern portion of the Sontal Parganahs originally pertained, and the consumption of spirits in this province is, I believe, greater than in all the other divisions of Lower Bengal put together.

The *mohwa* in Bengal is not confined to the Sontal Parganahs, as it grows in Chutja Nagpur, Orissa, and the south of Monghyr, and Bhaugulpur, it is rarely found to the north of Ganges, the only instance I have heard of is in the Begusserai Sub-division of Monghyr where it is said to be abundant. Many hundreds of maunds (82 lbs.=1 maund) of the dried flower are exported yearly from the Sontal Parganahs to Patna, and other districts.

The tree flowers in the Bengali month of *Cheyth* (15th March to 15th April approximately) sometimes lasting up to 15th *Boishak* (end of April). An occasional tree is to be seen flowering as early as the end of February, but this is exceptional. The flower is a thick juicy glove of pale cream color held in a velvety chocolate colored calyx, these flowers fall from the calyx during the early hours of the morning, that is from about 3 to 8 or 9 A. M., after which fresh flowers begin to open. The fall of the *mohwa* blossom is referred to by the aboriginal races as denoting a period of the year, like our harvest time. The village swains and maidens also fre-

quently make the mohwa gathering an occasion for love making.

Generally speaking it is the custom for all the *mohwa* trees in a village to be divided amongst the resident cultivators in proportion to their respective holdings; and when the trees stand in forest, it is the practice to burn away the under growth at their foot, so as to form a clear bed for the blossom to fall on. The women and children go to their trees every morning at about five or six o'clock to gather up the flowers, and to see that they are not stolen or eaten by the cattle. Each day the amount of flowers collected is removed in baskets to the 'angau' or open yard in front of the *ryots* house, and there spread out to dry in the sun. When the flowers have been gathered up and removed, the cattle are allowed to browse under the trees on the few stray flowers that fall during the remainder of the day, and such as escaped the eyes of the gatherers, or were not thought worth picking up: the poor people of the village are also allowed to glean whatever they can when once the bulk of the flower has been removed. A tree takes about fifteen days to shed all its flowers commencing and ending with a light fall, the main portion of the flower falling within about five or seven days during the middle of the period, at the rate of one to three baskets full daily according to the size of the tree; the total outturn of fresh flowers from one tree ranges from 16 to 32 baskets in a good season, being an average of 24, the baskets contain about 10 seers, thus giving the average outturn of a tree as six maunds, (552 lbs.) which yields about 1½ maund (1 ewt., 1½ lbs.) of the dried flower as exported.

The value of the *mohwa* varies greatly in different seasons; viz., from 20 seers up to four maunds of the dried flowers per rupee, according to the plentifullness or otherwise of the crop; the average price, however, is about one maund per rupee near the line of rail, and about 1½ maund per rupee in the interior of the district.

The flowers prepared for sale are not dried to the same extent as those kept for the family's consumption, as naturally the more they are dried the less the weight, and as it is sold by weight this would result in loss to the grower; as a fact the people are not above the trick of damping it prior to sale.

The Sontals and all the poorer classes are very fond of the *mohwa* flower both fresh and dried, but they cannot eat very much of it whilst fresh, as it is found by them to be very heating. If to be eaten fresh, it is simply blanched over the fire in a 'haria' (earthen cooking pot) for about two hours, half a seer (about 1 lb.) done in this manner is a good meal for a hungry man, no rice is eaten with it. Sometimes tamarind seeds are stewed up with it, the brown shiny husk of the seed being first removed; sometimes a little whole gram is stewed up with the *mohwa* instead of the tamarind seed; two or three meals of the flower cooked in this manner is however quite as much as any of them can stand for one season.

To prepare the dried flower for culinary purposes it is first of all well beaten by hand with a stick to knock out the stamens (called by the natives 'jili') from the flowers, as it is these which are considered by the natives to make the flowers too heating for the stomach; this being done the amount required is set on to boil in a small quantity of water, in the evening, and kept on the boil for four to six hours, it is then left on the embers of the fire till morning that the water may be entirely dried up, leaving the flowers soft and swollen; cooked in this way it is much better than the fresh flower, no rice or salt is eaten with it but tamarind seeds, *sâl* seed, and gram are frequently stewed up with it, as also a bean which the Sontals call *kurse* which they grow with their Indian corn for culinary purposes only.

The flowers are extremely sweet, but have a peculiar pungent and sickening flavour which clings to the mouth for a long time. An European eating even one or two of the fresh

flowers would probably be so up set as to be unable to eat any thing for the rest of the day.

The *modus operandi* for preserving the flower for storing is very simple, being to dry it in the sun for four or five days, if intended for home consumption it is well beaten as above described, but if for sale the stamens are left on as they add to the weight, and are said not to effect the quality of the spirit distilled from it. When sufficiently dry if no purchaser is ready at the door it is packed up in what is called a '*kuchuri*' (pronounced koochuree), a sort of hamper made of thick straw rope; having laid the foundation of 'the *kuchuri*, and lined it with straw they fill in the *mohwa*, and as they fill in continue coiling the straw rope round and round making each coil a little larger than the last lining it at the same time with straw; when half the amount they intend it to contain has been got in, they in the same manner decrease the size of each successive coil, so that when finished it has the appearance of a large ball of 'straw rope'; the coils of rope are kept together by several small cords brought up from the bottom of the *kuchuri* outside, and tied at the top, dividing it into quarters like an orange; *kuchuris* are made of various sizes from three to twelve maunds, but eight or ten maunds is the most common size parcels of a smaller size than three maunds though made in the same way, but some times without the lining of straw, are called *muri*. These *kuchuris* bear transport by cart well, and the grain or other produce kept in them is better preserved, and more free from dirt and weevil than what is kept in the earthen '*gola*'. Every ryot's house is fitted with two strong parallel timbers raised about one foot from the ground (which they call *dúla*), on which to keep these *kuchuris*.

The ryots sell the dried *mohwa* at about four maunds per rupee to the village shop-keepers and money-lenders, who again sell it to the Merchants or exporters, who are frequently the distillers, at two to three maunds per rupee at the begin-

ning of the season. The people are generally in such a hurry to exchange their goods for rupees that prices are very low when the crop if at all a good one, first enters the market; those who are wiser, or who are not so hard pressed for money hold back their stock, and sell to considerable advantage later on, the average price being as before stated about one or one and a half maund per rupee.

The principal use to which *mohwa* flower is put is the distillation of spirit, called *daru* or *shrab* by the natives. The spirit produced from *mohwa* very much resembles Hollands both in appearance and taste, but unfortunately it retains the peculiar sickening flavor of the fresh flower which is very disagreeable. This is due to the very strong essential oil which the flowers contain, but which could no doubt be removed by some chemical process, if indeed it would not disappear with age. At present the spirit passes into consumption within a day or two of being distilled, and I see no reason why the distillation of *mohwa* spirit for European consumption should not be made a very profitable undertaking to any one having the enterprise to work it; the flowers being procurable in almost any quantity.

In the Government central distilleries duty is levied on the spirit according to its strength as found by the hydrometer which is tested to denote proof spirit at a temperature of 80° Farenheit, the strength being recorded every day after the close of each distiller's operations. A graduated table is used to denote the relative strength of the spirit at various temperatures.

The process of distillation as carried on in these pergunnahs is briefly as follows:—One maund of the dried flowers is divided and placed in three large earthen jars, and two gallons of water is poured into each jar, fermentation quickly sets in and continues for about four days, on the fifth or sixth day the *mohwa* which has risen in the process of fermentation settles down and is then ready for the still. In each still the

contents of three jars of the fermented *mohwa* are placed which equals one maund of *mohwa* and six gallons of water.

Nothing is mixed with the *mohwa* except in the Pakour distillery where a small quantity of molasses is added to it.

The quantity and strength of the spirit mostly depends upon the subsequent treatment in the still, though it is also affected by the *mohwa* having been insufficiently fermented or by its having been allowed to rest too long after fermentation. I have found by comparison that where a distiller takes two distillations per day from his still he obtains about $4\frac{1}{2}$ gallons by each distillation at a strength of 32 below proof, whereas if he takes three distillations per day he obtains only four gallons at a time at 49 below proof; that as many as four distillations per still per day can be obtained with hard labor, but that the strength is proportionately low and the amount of spirit obtained less than when a less number of distillations are exacted, this appears to be entirely owing to the primitive refrigerating apparatus used being insufficient to cope with the excessive heat required for the more rapid distillation.

The distillers appear to find that it pays them better to produce a large quantity of weak spirit than a smaller quantity of strong—this is particularly noticeable under the out still system.

The arrangements for storing the spirit are also about as defective as could well be thought off, several large unenamelled jars exposed to the full action of the atmosphere, with only a piece of an old broken pot placed over the mouth to prevent any thing from falling in, compose the whole furniture of the store-room. In some distilleries I have seen the jars buried with a small wooden trap-door fitted over them which was kept locked, this is no doubt an improvement but not having a bung in the mouth of the jar must admit of considerable evaporation, especially when the spirit is put away hot.

Only one servant is maintained for each still, and he does

everything connected with it, even to bringing his own fire-wood, which in some cases necessitates his walking about two miles a day in addition to his other work. One man also is jointly entertained by all the distillers at a distillery to draw water from the well.

The refuse *mohwa* from the stills is used for feeding cattle, and is a very fattening diet, but it is not good for milk cows, as it imparts to a slight extent its peculiar sickly pungent flavor to the milk, not perhaps sufficiently to make it noticeable to all palates, but sufficiently so to make the milk disagree with infants, or persons in delicate health ; cattle, however, become very fond of it, and it is difficult to keep them from it when once they have got the taste for it.

The seed of the *mohwa* tree called by the natives '*konchra*,' yields a good oil, which is the second most important product of this valuable tree. '*Konchra*' oil is used for cooking, &c., & for lubricating purposes ; it is sometimes used with sugar to sweet meats, and very often used, I am told, in the filtration of *ghee* (clarified butter) which it retains more easily in consistency though it is white where as *ghee* should be a bright yellow ; I am sorry to say, like many other things, it is not always what it should be. The seed or *dill* as the natives call it is contained in a thin shell enveloped in a thick sweet succulent husk, like the '*deshibadam*' or country almond (*Terminalia catappa*) and about the same size or perhaps a little smaller : this husk whilst green in the month of May is much eaten as a vegetable, principally being cooked up into a curry (*echekki*) by all classes. When ripe, which is in the month of June, it becomes sweet and is eaten by the Sontals as a fruit to a considerable extent ; the cattle also are very fond of it. Even when ripe the husk remains green, but of a somewhat lighter or more yellowish hue.

The fruit is gathered by means of a long stick with a hook at the end of it, with which they either shake the branch

till the fruit falls or wrench the fruit off when it does not fall on being shaken. When quite ripe the fleshy husk bursts open of its own accord, and the seed is easily picked out with the fingers, the seed is of a rather rich dark brown, about the same color as the horse chestnut, but in shape it is like a large runner bean. The mode of extracting the kernel or *dil* is to soak the seed in water for an hour or so, and when sufficiently softened to strew it on the ground, a good hard place being chosen for the purpose, a heavy piece of board or plank is then placed on top, and worked backward and forward with the foot, which has the effect of bursting the skin; the kernels are then separated from the skins, and after being washed are placed in the sun to dry. The skin is not very thick, and is tough rather than hard, there is roughly speaking about one-third of skin to two-thirds of kernel, but between the outer husk and the seed with its skin the proportion is reversed being two-thirds husk to one-third seed that is to say taking the whole fruit as consisting of nine parts there is six parts fleshy husk, two parts kernel or *dil*, and one part refuse skin. Even this refuse, however, is not allowed to entirely escape doing its quota of work, for it is reduced to ash and mixed with the other sweepings and rubbish or thrown on the dung hill, and so goes back to the soil to enrich it for some other crop. The manuring of fields is practised in the Sonal Parganahs, and much trouble is taken with it; the burning of cowdung for fuel is very seldom resorted to except perhaps in the Godda Sub-division where there are large tracts of country bare of trees.

To extract the oil from the kernel, the kernel is first pounded to flour by a 'denki,' or crushing machine worked by the foot, or in an 'okli,' a large wooden mortar in which the native women husk their grain by hand, it is then placed in a 'haria' or large earthen pot having a small hole punched in the bottom, this 'haria' is then placed over another containing boiling water, and which is kept boiling till the mash in

the upper vessel has become thoroughly well steamed ; when steamed sufficiently the mash is removed, and divided into two equal portions, each portion is well bound up in ‘*sábe*’ or sabui grass (a very tough grass used for making string and rope and very similar to *Saccharum munja* though they are not the same), and placed one above the other in the oil press, called in Sontali, ‘*Pá/á*’ ; this press is a very rough contrivance—two upright posts are firmly set in the ground four or five feet apart, and so as to leave about four feet of the post above ground ; the upper portion of these posts for about three feet is squared off, reducing the thickness to about four inches by two and a half, and leaving a butt of about one foot above the ground, at the base of each upright ; over these uprights a substantial plank six or seven feet long, with two holes sufficient to let the thin part of the uprights pass through, is fitted so as to fall down and rest on the butts, about one foot from the ground. This horizontal plank at one end, extends about a foot and a half beyond the upright, with its edges rounded off ; in the centre between the two uprights a circular groove is scooped out in the upper surface of the plank to catch and carry off the oil, an iron or wooden lip being attached to the side of the plank below the groove to conduct the oil into a vessel, generally a small earthen pot placed below to receive it. The two packages of mash are placed one above the other within the circular groove, and a second plank similar to the one just described, but having no groove, is then fitted over the uprights so as to fall down and rest on top of the packages of mash. In the upright at the opposite end of the plank to that which is rounded off, there are three holes pierced, and through the uppermost of these a wedge of wood is passed above the upper plank to hold it down, one end of a strong hide rope is then secured to the base of the upright at the other end of the press, and passed twice round the smoothed off ends of the two planks, and hove as tight as possible by means of a wooden bar or hand spike ; when the

rounded end of the plank has been hove down to below the level of the wedge it is raised up again, and the wedge shifted to the second hole, the rope is then again tightened, and so on to the third hole.

The yield per tree in dried kernels, (*dil*) is from 20 to 25 *seers* (4L to 51 $\frac{1}{2}$ lbs.) the maximum is about 30 *seers*. Five *seers* of kernels yields but one *seer* of oil so that five *seers* of oil is about the average yield of a tree; a *seer* is about one quart. The price of *konchra* oil ranges from 2 $\frac{1}{2}$ to four *seers* per rupee.

The *kulli* (pronounced *kully*) or refuse of the kernel after the oil has been extracted, is not like other oil-cake of any use for feeding cattle, but it is said that snakes cannot endure the smell of the smoke it makes when burnt, and the Sontals therefore burn it to keep snakes away from the house, as well as to repress the swarms of flies and mosquitoes which infest agricultural villages.

APPENDIX.

APPLICATION OF MOHWA OIL TO ECONOMICAL PURPOSES.

Extract of letter from C. B. TAYLOR, Esq., Palamow, dated 14th September 1845.

I HAVE the pleasure to inform you, that I have despatched to your address a box containing the following mentioned oils, and which I promised you some time since. Hingun, Mohwa, (*Bassia latifolia*.) Cossum tree, Cossimfol or Safflower, Sun-flower, Poppy-seed oil, Cotton-seed oil, and oil of the Radish seed.

I think you will find the Hingun to be the purest of all these oils, and nearly equal, if not completely so, to Olive oil.

The Mohwa oil I also consider a very valuable oil, and which possesses the property like cocoanut oil, of "congealing at the ordinary temperature of the atmosphere" in the cold season, and could therefore I suppose, be converted to the purpose of making stearine, which is used in England for making soap and candles, for it was this quality of congealing, I suppose, that suggested the idea of putting the oil "in the state of lard" into hair bags and then subjecting them to a heavy pressure, the substance forcing itself through the bags being called elaine, and what remained

in them, stearine. It was the latter substance, after being purified, was found to make candles of a very superior quality, and I can see no reason why the Mohwa oil, being subjected to the same process, should not answer the same purpose; the latter oil would have the advantage of being much cheaper, for I think it could be sold in Calcutta for five or six rupees per bazar maund. It is applied up here by fraudulent people to the purpose of adulterating ghee, and must be very difficult of detection, as the colour and odour are nearly the same; the oil has a bitter taste, but is eaten by the inhabitants of this district, who assert that the bitter taste goes off when cooked with their food, and also when it is five or six months old. The sample I send is newly made.

Extract of a letter from C. B. TAYLOR, Esq., Palamow, dated 27th March 1846.

I TAKE this opportunity to inform you, that I have fully proved the capability of Mohwa oil, (*Bassia latifolia*.) being converted to the purpose of making candles and soap, as suggested in my former letter to your address. I tried the experiment in the month of December last, performing the operation of pressing during the night in order to ensure a sufficient degree of cold. I commenced at 9 P. M., with the thermometer at 60°, and kept the oil until morning under pressure, the thermometer standing at sunrise at 40° or 35° Fahr. With the stearine so obtained, I made some candles mixed with one-third of mutton fat, and which burnt well, and about as long as a tallow candle would have done; but my press was not at all adapted to the purpose, being nothing more than a long straight piece of wood, tied at one end of a tree, and a weight put at the other end, the oil being enclosed in a bag, and placed near the middle of the lever; there can be little doubt, that with a press of sufficient power, as good stearine could be obtained from the Mohwa oil as is now obtained in England from the cocoanut oil, and the former would have the advantage over cocoanut stearine of being edible, and might therefore be used as a substitute for butter; cocoanut oil being unfit for human food.

I propose sending you five or ten maunds of oil, and which the Society can forward to England for the purpose of being made over to any of the manufacturers of oil possessing a stearine press, who would engage to give us a sample of candles and soap made from it; by adopting this course, we shall not only find out the value of the oil for the purposes to which we suppose it may be

usefully applied, but at the same time will be making its useful properties known: remember I have little chance of making anything that would be approved of without being possessed of a proper press, and have merely proved the fact, that it may be applied to the same purposes to which cocoanut and palm oil are now being successfully applied in England.

*Report on the Oil of the seed of the Mohwa tree (*Bassia latifolia*.)*

Communicated by the Society of Arts.

ADELPHI, 13th September, 1848.

I AM directed by our Committee of Chemistry, Trade, and Manufactures, to forward to you the following report relative to the oil of the *Bassia latifolia*.

The receipt of your parcels of oil having been reported to the Council, the same were referred to a joint Committee for consideration, and the following are the results of the experiments which have been made. An analysis of the oil having been made by W. Hawes, Esq., the following is his report:—

" Its specific gravity is .926, in appearance it consists of a number of round crystalline grains of solid matter (stearine), embedded in an oily fluid (elain). It saponifies easily with the production of glycerine and the usual grease acids, but I could not detect lactic acid in the product; the resulting soap is good as to quality and color, and satisfactory as to quantity.

" The coloring matter in the oil passes off in the spent ley to which it communicates a brown color, similar to that produced by other vegetable oils.

" The grease acids produced after the saponification of this oil are easily separated by pressure, and afford at 40 per cent. of stearic acid, and which is inodorous while translucent, and appears admirably adapted for candles.

" If the oil can be obtained in bulk in the same state as the sample, the solid and fluid parts may be more easily separated than in most oils, and by the simple process of draining, which consists in melting the oil and allowing it to cool in a room, in tubs, heated to that degree which will allow the stearine to crystallize, leaving the elain fluid.

" When the crystallization is perfect, a plug in the bottom of the cask is removed, and the elain drawn from the solid mass, and two beautiful products are obtained.

"The elain obtained in this process from tallow is fitting for soap-making and other rough purposes. From palm oil it is too much colored to be applicable to many uses, but that obtained from this oil is superior to either, and in its appearance and properties resembles olive oil, and I think for many purposes would be as useful, especially for dyeing.

From the examination of the oil, which I have been able to make, I have no doubt that if it can be produced at the cost of palm oil, any quantity can be used advantageously."

Although Mr. Hawes went fully into the matter, I regret that the Society did not receive any specimens of the manufactured article.

Mr. G. F. Wilson, Managing Director of the Patent Candle Company, also furnished the Society with a report, in which he states, "that the worth of the *Mohwa* oil in this country, for the manufacture of candles, in £8 per ton, less than Petersburgh tallow, and after making a great number of experiments upon it, he finds it to be of the same value as cocoanut oil, as its being harder makes up for the color being inferior. Large quantities could be used in this country at about £35 per ton." I send some of the candles and oil as returned to the Society by Mr. Wilson, but he fears, that they will not remain in a solid state through the voyage to India: * there are, however, processes by which candles could be made from this oil sufficiently hard for the Indian market. Samples Nos. 1 and 2 in the parcel sent are those by Mr. Wilson.

The oil having been further examined by Mr. John Thomas Cooper and other eminent Chemists, they reported that the sample of oil appears to be similar to the African Sheea butter, except that it is somewhat harder, and it would doubtless be an important introduction into this country if its price would admit of its competing with palm oil.

In addition to the above reports I am directed to inform you, that the Society caused several other experiments to be made with the oil by manufacturers of soap, and sample No. 3, is a specimen made by Mr. R. Hendrie, with a minimum amount of alkali; and No. 4, a specimen by Mr. Bortram, of soap manufactured by a new process, this specimen is much harder and more compact than the preceding.

The whole of the parties to whom it has been submitted agree that it is likely to be of great importance for most commercial pur-

* The candles reached in a half liquified state.—Eds.

of the cob which yields a superior material for manufacture into paper is almost as a rule burned. ' In Germany, Austria, and Hungary, a very superior kind of paper is made from the sheaths, or envelope of the maize cobs. Maize paper has none of the brittleness peculiar to ordinary straw paper. Maize paper appears to be the most unexceptionable of all the papers *not* made from rags. Not only is it remarkably tough, but it is devoid of all the silicious matter which proves so embarrassing in ordinary straw paper, causing great brittleness when folding and rapidly destroying the face of printers type. The extreme toughness of the paper makes it particularly eligible for Bank note paper and for the purpose of envelopes. The colour is somewhat yellowish, but it is easily bleached.'

This really valuable information (whence derived is not stated) is all but lost in 4½ columns of matter connected with maize cultivation, and to be found in the *Indian Agriculturist* for September 1881, at page 250.

There is a first class paper mill at Lucknow, and the Maharaja Scindiah started a paper mill now in the market. Now if any suitable organization existed, all the maize cob sheaths produced by the Zemindars of Oudh, might be made to find their way to Lucknow, for conversion into superior paper, and in like manner, if Scindiah's paper mill was set up in the Allyghur District on or near the Ganges Canal, all the maize grown within 50 miles on each side of the Canal would yield up their cob sheaths to the paper maker, and we should see Upper India producing first class paper from what is now looked upon and treated as a valueless waste substance.

The Agricultural Department could very easily cause it to be made known, that if the Zemindars preserved the Indian-corn cob sheaths, purchasers would be found for the article, and then one paper mill would not suffice to work up the material made available from Hurdwar to Allyghur, leaving all below Allyghur to be utilized at Cawnpore where another paper mill should be started.

There is ample money in the country to carry out the project, and if ventilated through the proceedings of the Society would carry great weight. I venture to predict that the thing would be done."

Since the above was written I have had a communication from Mr. Maries, of the Raj-Garden, informing me that the maize he has sent down, was grown in light garden loam and cow and horse dung used in trenched ground about 15 inches. Seed was sown in September fit for use in December, and was obtained from Veitch and Sons, London, as "Canada early Maize." The cob sent were not selected ones, the whole crops being alike.

And Mr. Parsons, the Superintendent of the Ajmere Garden, has kindly afforded me the following particulars in response to my application:—"The maize grown in the immediate neighbourhood is a very small yellow kind, both cobs and the grain itself being inferior in appearance. In favourable seasons, however, good crops are obtained from it. This kind has, I am told, been cultivated from time immemorial. I am further informed that Colonel Dixon sent the maize he imported into Merwarra where there is now a white kind grown said to be not indigenous to the district. It is not, however, brought into this part for sale, and I have not seen it myself. Should this be correct it seems strange that it was not established in the Ajmere District also, I have been over a considerable part of it but have never met with any kind but the one I have referred to. Mr. Saunders, the Commissioner of Ajmere, Merwarra, is now on tour in the last named district, and I have sent your letter to him. If he can procure further information on the subject, I will write again on hearing from him."

Note on Vanilla culture in Lower Bengal. BY THE SECRETARY.

[THE following note was prepared nine years ago for a Correspondent of the Society who was desirous of learning if

the Vanilla plant could be profitably raised in Lower Bengal. It has been thought desirable to introduce it into the Journal to shew that the plant did not succeed in the Society's Garden.]

During the years 1854-55-56, the Agricultural and Horticultural Society paid considerable attention to the cultivation of the Vanilla plant (*V. planifolia* and *aromatica*) in their Garden. (The result is recorded in the Journal Vols. IX and X Vol. IX, p. 316 and Procs. 125 and 210 and Vol. X, p. 115). Subsequently to this Mr. W. Money formed a plantation of Vanilla on the opposite side of the river (Seebporé); but to the best of my belief it entirely failed, and I believe is not now in existence. In my humble opinion Vanilla cannot be profitably grown in Lower Bengal. We found the cold of January fatal to it in many instances. The pod ripens in the cold season, and the cold wind generally experienced in December and January nips it before it has fully ripened, and it falls to the ground: several attempts were made to remedy this but without avail.

A fully formed Vanilla pod of the kind grown at Mauritius and Bourbon, probably the finest in the world superior even to the produce of Brazil, is about nine inches in length and rather more than one inch in circumference. I have now before me a bundle of such more than fourteen years old, and the aroma as fine as when plucked.

The finest of the pods raised in the Society's garden were about five inches in length and half an inch in circumference. The mangoe would seem to be a good tree for the Vanilla to be trailed on: our finest plants were, however, grown on the country almond (*Terminalia catappa*). We had also some grown on a "machan" raised four feet from the ground and underneath a quantity of dried leaves were placed to induce a degree of warmth, but the principal object was that the Gardener might the more easily watch the growth of the pods and gather them at the proper period. Moreover, this mode of growth admitted of easier artificial fecundation.

Correspondence and Selections.

ON THE DEVELOPMENT OF RURAL INDUSTRIES.

IN turning first to agriculture for discussion at this assembly, a plurality of questions presents itself:—What must be the main and final aims of agriculture? What are its future prospects here, with all advantages and disadvantages? What is its scope in these colonies? What relation does it bear here to the tillage of other countries? And what mode of scientific teaching is best adapted to advance its interests among us? These are some of the weighty considerations in which this and future congresses may share. The fundamental principles of agriculture will ever be, to realize from a given area the greatest yield at the least cost, while nevertheless the fertility of that area is to be maintained, and while collaterally operations are to be so conducted, as to admit of bringing with facility new tracts of (even barren) country under the plough. But these are not the only final objects, most momentous though they are, inasmuch as still other problems have to be solved: namely, how cultures in their variety can be so multiplied, according to climatic adaptability, as to augment the sources of profit, to facilitate still more the means for successive rotation, and to render tillage nowhere largely dependent on crops few or perhaps even solitary in their kind. Already in these young colonies we have seen wheat-fields invaded repeatedly by the rust fungus, and this so detrimentally as to blast, for a time, the prosperity of a vast section of our community, a calamity still just as much to be dreaded here as in ancient Greece and Rome. The horrors arising from the potato-murrain in the home countries will be still in vividly dreadful recollection of many of you here. In recent years ruinous impairment or even complete destruction of the vineyards was witnessed in many parts of South Europe, in consequence of two diseases, one still more formidable than the other, that of the oidium and of the phylloxera; both unfortunately spread to Australian soil, the one now under control and elimination, the other, let us hope, to be subdued finally. We have heard in our own days, how in the Canary Islands, and in countries at the Mediterranean Sea whole orange-groves became blighted and destroyed, which until lately had passed from father to son, through many generations, as a patrimony considered ever unimparable. We have witnessed large sugar-plantations almost annihilated by borers,

irrespective of troubles from fungaceous affections, and we have become aware of the sad inroads of the Hemileia mould on coffee-estates, the loss from this scourge to Ceylon alone amounting, since the baneful effect of that fungus became felt there (since about a dozen years), to fifteen million pounds sterling. But, dreadful as these afflictions have proved, what are they compared to the horrors of extensive famine, whenever in India the rice crop fails, on which the greater portion of the 200 millions of the native population mainly depend for sustenance? To mitigate or prevent all this, there is ample scope for the meditation as well of the statesman and geographer as for the microscopist and the chemical operator; the rays of their thoughts and reflections, as well from the legislative hall as from the scientific laboratory and the traveller's field, might be brought perhaps to a luminous focus.

Our friends beyond the Pacific, living also in new states, have outrivaled us by the establishment of numerous agricultural colleges. The new generation of farm-proprietors, arising in these colonies or elsewhere, will not be able to hold their own in the keen struggle for competition of country against country, and will be left behind in the race, unless agricultural training is effected more extensively on strictly scientific principles. Agricultural societies, liberally supported by the State, have done much here to elevate rural pursuits, by competitive exertions. Could not even a solitary analyst be attached to each of the larger societies? Would he not pave the way to local agricultural schools, where means for larger central colleges with higher aspirations and more costly appliances would not early be available? Could not a professorship for agricultural science be created in our University? I fancy, that somewhat less expenditure on agricultural shows—though not to be undervalued for a moment in their telling importance—to save thereby some funds for the commencement of methodical rural teaching, would go far to solve this question. The times have passed, when the relation of chemistry to agriculture could be viewed with unrecognizing indifference, or when the offerings of phytologic investigation could be met lightly or even perhaps sneeringly. Scattered settlers, under early struggles, with slender means, are here almost forced for a while to continue trudging along the trodden lines of crude empiricism, as indicated in the past; but when the population also here will have become denser, and land will have reached a higher value then also the productiveness of the ground must be made to increase correspondingly, and that can only be achieved by adherence to the doctrines, established by the toil of great investigators, for securing by the most rational of management the permanency of our fields. To a sister colony, at no great distance, the credit is due of having in this part of the world

first of all originated and established an agricultural college (in the province of Canterbury, New Zealand) an auspicious event, hailed with satisfaction by every one, who wishes farming placed on a scientific basis. This is a grand step, which should be followed elsewhere. Minor institutions for initiating into rural training may be very different in the extent of their organization, but higher colleges of agriculture, when fully developed, must have a wide curriculum. Thus necessarily some insight is required into surveying, and engineering, into geologic formations and phytologic forms, into chemical analysis and microscopic revelations, into rural zoology and veterinary art. Moreover, the acquisition of some linguistic knowledge (not even in State-schools out of place) would, prove advantageous commanding the leading literature of the world also in this field. Then a knowledge of the best methods of recording calculations has to be acquired. Furthermore, there is to be provided an experimental ground for that practical training, which is to give vitality to these studies; besides the student must get acquainted in some respects with the now-a-days complicated mechanism of machinery, subject to alterations through improving inventions, when even gradually the amply-ruling power of steam comes to pervade also the rural realm. In addition to all this, the agricultural disciple has to be practically initiated into the doctrines, which govern the rotation of crops, the modes of irrigation and drainage, the rational application of fertilizers, as well as the remunerative search for them. To this comes still the actual test in each climatic and geologic region of any and all sorts of plants, whether marketable through local use or through foreign commerce. In sketching out in full the claims of modern rural teachings, as often has been done before and also here in this colony, it is not to be assumed, that every holder or administrator of landed estates is to advance to the standard of knowledge of an agricultural professor; but the deeper his insight into any of the disciplines of husbandry, the greater will be his gain, the more lucid will be his example, the more benefits will he confer on the community.

Accustomed to the routine of home countries, those settling nearer or within the tropics have to strike out on new paths, have to emancipate themselves to new ideas and enlarged views. On preferential selection and sequence a great deal has yet to be learnt even in the countries of our youth, how much more then in new regions, which are only being conquered for civilization. The range of culture must thus necessarily become wider and wider; its scope in all warm zones is of enormity. It may not even be a hopeless endeavour, to add to the cereals of antiquity and the corn of the western world, or to augment the kinds of ordinary root- and fruit-crops, which we possess;

for we should reflect from how apparently unpromising original plants—many overlooked and unrecognized by us in their wild state—have arisen some of the main staples of the vegetable food of the world.

As rurally eligible could be instanced a whole host of select oil-fibre-pulse- and scent-plants of unquestionable commercial and pastoral remunerativeness (including the ever demanded cotton), which like cereals yield a return in less than a year to the first occupant of the soil, with some preferential claims to local husbandry. Perfumery from plants, supplied by London and Paris alone to the world, represents two millions sterling annually. Of vegetable fibres, raw or woven, we import over one million pounds worth a year into this colony; even of castor-oil for machinery we obtain annually to the value of £60,000 from India. Sorghum and recently also maize have come in as rivals of beet and cane for sugar; they, like tobacco and many medicinal plants, give also, as well known, a harvest in a season. Whoever can afford to wait for a return as long as that of the vine, may plant the Chinese tea-bush. Whoever can hold out somewhat longer, may plant the olive, and should he live in a region free of frost as well as of aridity and of extreme heat, he may raise the Peru bark-trees. Our fellow-colonists in Queensland and in the north of New South Wales, in a more genial clime than ours, go a-head with sugar-cane and the coffee-shrub, doubtless to be followed on a large scale by cassawa, the cacao-tree, gutta-percha and indiarubber trees, spice plants, cocoa-nut and sugar-palms, and by a multitude of such trees and bushes, as would ripen in Australia their delicious fruits throughout a littoral tropical tract, comparable, so far as mere extensiveness is concerned, to that from Scandinavia to Egypt. As far south as Gippsland the hardy Chilean arrowroot has, through the thoughtful assiduity of a missionary, years since given astounding produces, the plantation originating from a single root offered by my hands. What near to us one single plant, such as the yellow lupin could do for green manure, is never yet realised here. No snow-fields existing here except in the highest Alps, the stable management is under our sunny sky reduced to a minimum, yet the remnants from oil and sugar mills will play also here a great rôle in future. Honey, one of the wholesomest but most neglected of culinary articles, could in all winterless zones be produced to an extraordinary extent collaterally on any farm, if some regular plots of honey were so established, as to afford plants to hives, vastly multiplied and settled in more ingenious frames, a copiousness of blossoms from spring to autumn, a real flowerless winter being here as unknown as in two-thirds of the other inhabitable parts of the globe; the total annual quantity of honey and wax exported from Havannah alone, as part-produce of Cuba (an island of

about half the dimensions of Victoria) would alone freight a large ship. Silk, in reality a product pertaining to agriculture, claims for the morus merely copse- or hedge-space, though certainly also abundance of cheap labor, mostly to be supplied domestically; the average annual yield of gold, obtained in all the Australian colonies taken together, would not be sufficient to purchase the silk produced in France alone in one single favorable year. Basket- and wicker-willows can be grown on any spot accessible to irrigation; but the importance of such and a multitude of other plants of apparently minor consideration becomes only clear by reference to statistics, though we would likely choose them here in varied cultural accumulations merely as auxiliaries for the thriftiness of our farms.

Perhaps the greatest stimulus, hitherto accorded in these colonies to agriculture, has been through rural journalism. The information thus scattered broadcast over the land has been both vast and continuous; but we labor in this respect under a difficulty much impairing the permanent good, wished to be achieved. The uncountable number of cultural and pastoral articles, which arose from the journalistic press, are so widely scattered and so intermingled with other records on the spacious pages chiefly of large weekly periodicals, as to get soon ephemeral or at all events difficult of permanent access to the multitude of those readers, who are chiefly to be benefitted thereby. Epitomised reproduction in book-form of what interests farmers and graziers through a spirited and enterprising publishing firm is perhaps unwarranted under the probable inadequacy of support in young and not yet very populous communities; but a step might be made readily enough, to facilitate access to local agricultural items, avowedly replete with trustworthy and original information, if annual and somewhat explanatory indices could be issued concerning the agricultural, pastoral and perhaps also other industrial contents of weekly papers. To the officers of the Victorian Agricultural department, the first of its kind in these colonies, both tillers and graziers are also indebted for instruction and aid in many ways.

Let us now turn, for rural comparisons, to older settled countries with a climate similar to ours, and let us try to indicate, what might be done here in time, if we contrast the productiveness of other lands with our own resources and prospects. The kingdom of Italy, about equal in area to the two colonies of Victoria and Tasmania combined (Italy 109,739 square miles, Victoria and Tasmania together 114,413 square miles) supports a population of 27 millions of inhabitants against our own one million in the two colonies. There is no reason why South East Australia should not be as densely populated at some future time. Although the agriculture of

Italy is behind that of Britain, and although nine million acres are there wisely left covered by forests, yet about 20 millions are devoted to the cultivation of cereals, while the above-mentioned two colonies have as yet only the twentieth part of such space under corn of any kind. Rice, which is hitherto not all reared in our division of the globe, is grown in Italy on more than half a million of acres, and yields a more prolific crop than any one of ours, unless maize, averaging nearly half a hundred bushels per acre. Many tracts of the Australian colonies, where irrigation can be commanded inexpensively, might be turned into as smiling features as those of the plains of Lombardy rich also in rice. Of vineyards, Italy possesses as many millions of acres as we have thousands in Victoria. Again, Austro-Hungary has also about as much land in vineyards as Italy ($4\frac{1}{2}$ millions in Italy, little over 4,000 in Victoria), while France alone keeps still a greater area under vines, notwithstanding late disasters, than all Australia in the whole extent of its cultivated lands. The rearing of the olive, another mainstay of Italian agriculturists, has for commercial purposes here only commenced. The olive-groves of that country occupy a territorial surface as large as all the land under tillage in South Australia, and considerable more than that under the plough in Victoria. Some of the olive-plantations in Southern France are worth as much as £200 per acre. Not unmindful of this important culture, I have shared long ago in bringing many of the richest varieties of the olive here. Even the cotton-plant is made to yield its indispensable fibre as far north as the warmer parts of the Italian peninsula, where 18,000 tons are annually raised. As regards silk, Italy alone exported in 1878 more than ten million pounds weight, worth about as many pounds sterling, irrespective of what was required for home utilisation there. With all this, Italy sustains more pastoral animals than Victoria and Tasmania, having twice as many horses (477,900 against 241,300), nearly three times our number of cattle (3,489,000 against 1,258,000), though only about two thirds of our number of sheep (6,977,000 against 10,487,000).

The area of the United States of America, exclusive of the inhospitable territory stretching along Behring's Straits, is about equal to that of all Australia, but possesses nearly 16 times as many inhabitants. The southern and western states of the Union are climatically not dissimilar to much of extratropical Australia, except that the winters are colder. For us, it is significant to observe that, as regards cereal culture, the turn of attention has been there preferentially to maize, so much so, as to allot to that plant nearly double the extent of ground occupied by wheat, with relatively a double or threefold harvest-return. Even as far south as Gippsland, this highly prolific corn-plant, so well calculated to add also to palatable culinary

dishes, has been as exuberant in its yield as in those parts of the globe, where it attains the maximum of its fruitfulness. Cotton-culture comes in the States up to half the whole grass-culture at the present time, and cotton holds, notwithstanding the labor changes brought about by the fratricidal war, by far the supremacy as an article of export. Great Britain alone took thirty-six million pounds worth of raw cotton from the United States in 1879. What a lesson to us in Australia, where this highly utilitarian plant, in genial regions of very wide extent, could be made to yield artlessly a quick collateral return on the fresh grounds of many a new selector, while this culture hitherto continued excessively circumscribed, notwithstanding the splendid product attained in littoral East-Australia. Statistical calculations (so ably brought before us by Mr. Hayter) demonstrate, that out of a total of nearly 2,000 million acres of Australian territory we have as yet brought little over 6 million acres under tillage, an insignificant fractional percentage indeed. The United States of America have hitherto subjected nearly 150 million acres to cultivation (and by far the greater part of this in the present century), thus they were able to provide the teeming population of Europe with about 25 million pounds worth of breadstuffs in latter times annually, as shown by the Exhibition records. What wonder then, if even in the far west of the States is witnessed the spectacle of whole prairies being transformed into a vast waving expanse of cereals, on which to reap and bind, the guiding hands of one conductor of a machine replaces the wonted exertions of a dozen workers or perhaps more. Australia bids fair to follow in this path of sweeping enterprise; but let us trust, that neither here nor there this will prove a process of rapacious exhaustion of the soil. It is surprising to perceive, how the annual export from the United States of bacon, ham and lard equals or exceeds in value (about £20,000,000) all the wool produced yearly in the Australian colonies taken together, the American farmers in distant localities thus turning the surplus of his corn to highly profitable account.

I spoke of tea culture, have done so for more than 20 years, and have tried to pave the way for it here. We had, at all events, as a practical demonstration of the feasibility of this culture, a sample of Victorian tea already in the London Exhibition of 1862. Tea is imported annually to the value of about half a million pounds sterling into Victoria alone, while over nine million pounds worth go to Britain. To how many hundreds of millions of pounds weight the total production in China may amount, as well for local consumption as for export, is difficult of estimation. The Japan Tea, of which we have such splendid samples in the exhibition, comes from provinces similar both in climate and soil to the lower hilly regions of

Gippsland. Numberless localities of Queensland and New South Wales are fit for the tender Assam-tea. British India, partly through imported labor, had in 1876 already twenty-nine million pounds in the market, though the first plantations were only formed about 20 years ago. In California and in the Azores, now only a commencement is to be made in this culture, and doubtless even South-Europe will after ages at least have tea of its own. The cheapness of labor in China need not deter from entering into competition. Pedestrian carriage, export and import duties, insurance and sea-freight represent a large share of the cost of tea. Add to these considerations, that the ingenuity of the Assam planter soon reduced the 8 or 9 processes of Chinese manipulation to 4 or 5, and simplified them further by machinery, with vastly increased returns from the hands employed, and with a stronger and also nicer article into the bargain. Let it be understood, that tea is merely the young leaf subjected to slight fermentation and torrification, and that the fresh gathering can pass, if so desired, within one week into the mercantile chest. We might thus readily foresee, that tea is destined to be one of the great staple products of these colonies, that the rearing of this mercantile commodity will give accessory and easy employment here to juvenile labor, that in apt localities it will help on the struggling farm families, and become moreover a powerful weapon to subdue insobriety.

This instance is singled out purposely to show, how misguiding prejudices can paralyze new industries, be they ever so hopeful, not only in new settlements but also in the oldest countries of culture. So it is or was with the Peru bark-trees. The introduction of Cinchonas into India must be regarded as one of the greatest feats, accomplished in recent days, for extending the scope of tropical and subtropical cultures. It commenced only in Java in 1851, and somewhat later in British India. Plants sent out by me experimentally long ago have proved hardy in the latitude of our metropolis; indeed these precious sorts of plants are grown now also as far north as Madeira. Lofty mountain regions are not absolutely necessary for the Cinchonas, though the richest yielders inhabit high elevations; what possibly may be lost of alkaloids by growth of these important trees in lower lands, is likely to be compensated for by exuberance of development; but equability of a mild and rather humid clime, freedom of frost and command of rich forest-soil are essential for the growth of Cinchonas. The raising of the plant is effected with extreme facility from seeds, which are very light in weight, and therefore easily transmissible; bark for quinine and the other alkaloids is obtained after the fifth year; the trees now in the upland-plantations of India count by the millions, and the annual stripping of bark amounts

to hundreds of thousands of pounds already. There are regions in Australia, where the growth of Cinchonas would be almost as easy as that of the wattle-trees though not so quick. The unpretending beet-plant, passed by most of you unnoticed in its wild state on the British shores, yields in Europe already more than a million tons of sugar a year; indeed lately about one-fourth of the whole sugar-supply of the world, and at present perhaps more. France, with an European area less in extent than that of New South Wales, produced in 1878 over 350 million lbs. of sugar, though its geographic latitude excludes the cane from its cultures. The United Kingdom alone requires one million of tons annually at present. What the sister-plant, the Mangold, has done for reforming home-husbandry, through stall-feeding, will be within the knowledge of all of you.

Jute-fibre, first sent to the spinneries of Dundee only about fifty years ago, stood in 1879 actually ahead of flax as an import article of Britain to a value of more than three million pounds sterling. The Jute-Corchorus, so very manageable in the separation of its fibre and annual in its growth, has been tested as adapted to climatic regions, even so far south as those of Port Phillip. The value of jute-bags imported into Victoria solely for wool-packing is now about £60,000 a year. The jute-bags required in the Dutch colonies for the packing of rice, sugar, cotton and particularly of coffee, number about two millions annually, yet the first great factory in Holland was only opened fifteen years ago. The requirement of this fibre alone for carpets is enormous.

Ceylon, that gem of tropical islands, which, as regards its dimensions, we might compare with Tasmania (not fully as large), exports merely of Coffee annually to the value of nearly three million pounds sterling, and sustains on its own limited soil a population as numerous as that of all Australia at the present time. The value of Coffee-land held there by Europeans reaches to nearly eight million pounds sterling; but what may be still more startling, the value of Cocoa-nut plantations of Ceylon—so the able Exhibition Commissioner of that colony informs us—exceeds still that of the Coffee-estates, reaching to nearly ten millions. This is indicative, to what extent in future time, with more extensively available labor, the productiveness also of equinoctial regions of ours may yet become enhanced in such crops, as clime excludes from European culture and from the fields of all other extratropic zones. What is there to prevent us from fringing some thousands of miles of Australian coast-lines with the Cocos-palm, and to establish with it, as suggested already by Capt. Flinders, also on the corals of the reefs everlasting beacons for navigation?

Mauritius, with an extent not exceeding that of Flinders-Island (a spot near to us and disregarded by us), supports on its own soil, of certainly surpassing productiveness, a population outnumbering ten times the whole colonial inhabitants of the large extent of West Australia, and manages to export in value nearly as much annually as hitherto the whole vast territorial possessions of South Australia. Fibres raw or spun and woven, from plants fit for Victorian culture, were imported into our colony to the extent of over one million sterling in 1879; of grain and pulse Victoria needed from elsewhere in the same year to the value of half a million sterling. What poultry means as a farm-resource might be estimated by the fact of England importing about half a milliard of eggs annually, chiefly from France. Butter, lately experimentally shipped to Europe from here, is sent to Great Britain from abroad to the amount of over ten million pound sterling a year.

But where shall I stop in these comparisons, and why should I detain you on the danger of being tedious with details, with which we can more aptly deal in subsequent discussions of the Congress.

And now a few words on science in relation to husbandry.

In a masterly address, delivered by Dr. J. H. Gilbert, before the British Association in its chemical section this year, he has traced the progress of chemistry in its wide appliance to agriculture. Partly from this comprehensive lecture and partly from cognate historic data, I should like to offer a few illustrative observations. Passing the discoverics of the great men, who at the end of the last secular period regenerated chemistry to a genuine science, we come to the first special labors in rural direction by Theodore de Saussure, rendered literally known in 1804, and evoked by kindred researches of his father and his grand-parent; he turned to account for his extensive experiments in phyto-physiology and phyto-chemistry the immortal labors of Scheele, Priestly, Lavoisier and practically applied in this region of knowledge the ingenious researches of Hales on the movement of the sap of plants, of Ingenhouz on the evolution of oxygen under sunlight in vegetable respiration, of Scenbier on the derivation of that gas from carbonic acid in the assimilation-process of plants: and he was led further on by the investigations of other early observers, which separately to scrutinize we cannot stop on this occasion. How the enormous mass of carbon in plants is obtained from carbonic acid, how nitrogen becomes accessible for organic nutrition, how far the incombustible ingredients of plants are proportionately yielded by distinct geologic formations, how they become in measured proportions a necessity for vegetable alimentation, and how far separate organs of plants have different chemical constituents, were questions early considered or solved by Saussure. Soon subsequently,

and to some extent simultaneously, Sir Humphrey Davy stepped forward with his numerous and practical observations on the chemical composition of plants, soils and manures; he thus lucidly advanced still much further the recognition of the chemical laws, which now govern modern agriculture in close application to practice; it was he, who thus largely laid the foundation to agricultural chemistry as a science, through the influence of which British high-farming took early the lead in the husbandry of the world. Later in the century, after much additional knowledge from many literary sources had flowed together, the telling investigations of Boussingault commenced, and were through nearly fifty years carried on nearly to the present day; the sources and significance of nitrogen, foreshadowed by Saussure, and insisted on by Sprengel, Mulder and others, for vegetable nutrition, on which vexed and complicated question so much discussion still goes on, were reinvestigated, the rotation of crops was more scientifically regulated, the nutritive constituents of plants further analyzed, the relation of meteorology to agriculture traced out, and many kindred inquiries carried on, in which important labors Dumas extensively co-operated with him, and for which the substitution-theory of the last-mentioned savant became of great service.

Just as Saussure preaced Davy, so Boussingault was the precursor of Liebig, through whose pre-eminent exertions, with the co-operation of many other leading chemists and physiologists, agriculture has advanced from the crude handicraft of former centuries finally to the rank of a refined art. It was Liebig—who in the wide range of his discoveries, much at the special request of British agriculturists, investigated many of the chemical changes in both empires of organic nature—who dispelled the erroneous notions on the direct nutritiveness of humus—who demonstrated the vast yield of nitrogenous compounds from the atmosphere—who insisted on guarding against the loss of ammonia in manures—who more forcibly and perseveringly than any one urged the full restoration of the inorganic fertilizer carried away constantly from pastures and fields—who confirmed experimentally how the want of any one of the incombustible elements for vegetal nutrition rendered the rest largely inactive—and who explained so luminously the relation of chemistry to physiology in its rural bearings from strict analysis.

It is as impossible as it would be invidious to assign, in a few passing words of an address on an occasion like this, the due share of praise, to which each discoverer in this wide field of knowledge is entitled. In succession a whole series of men of learning have striven ahead in these intellectual and practically remunerative labors, though frequently the reverse of remunera-

tive to themselves; and the select of several nations have sustained the dignity of their country also on this particular path of the world's progress.

The influence exercised by teachings like these has been as immense as the advantages arising therefrom have been incalculable. Simple and insignificant as these questions appear, they are identified with the rural wealth of nations; without adherence to them no end of farms would have sunk into comparative sterility, and the measures for the utilization of egesta and sewage, in the consideration of which the value of countless sums is involved, would have been far more neglected than is the case actually still. Much in place of what was lost, guano, Chili-saltpetre, ammonia-salts were called to aid from abroad as strongly nitrogenous fertilizers, adding millions to the commercial wealth of many a state, and increasing for the time rural productiveness astoundingly. It became further understood, that phosphoric acid, potash and ammonia, as singularly and wisely ordained by natural laws, are largely absorbed in porous arable soil, not washed away, as long supposed; and that nitrous combinations became available, as Schoenbein proved, by every combustion for subsequent precipitation along with other aerial nutriment. All such were leading achievements, not to speak of a whole array of others.

If Lawes and Gilbert had done nothing else but to demonstrate in extensive experiments, that the nitrogen for the alimentation of plants is largely derived from the soil, whether natural or manured, they, by the important guidance thus afforded, would ever be entitled to the gratitude of all agricultural communities. Since more than a third of a century these champions of rational agriculture have rendered Rothamstead celebrated. Who would not ardently wish that a Rothamstead should arise also on Australian soil? And here let us becomingly recognize, that it is the generous President of the rural section of this Congress, who with sagacious foresight has drawn a true son of science—the accomplished secretary of our section—as a main pioneer of scientific agricultural interests into our very midst. Under such auspices Australia is not likely to stand behind in these emulative efforts, especially when competition in original researches of such kinds has commenced now even so far away as Japan and the La Plata States.

The system of agricultural chemistry, which gradually has become solidified, allows us, with almost mathematical precision, to recognize the particular value of any cultural soil, enables us to foretell the exact requirements of special plants for their particular alimentation, and guides us accurately in the choice of original or restorative fertilizers. The scales and weights of chemical investigators have fixed with unerring exactitude the relation of vegetable growth to nutritive constituents, and thus

the long hidden laws of organic assimilation were traced, which demonstrated that these processes, like all others in nature, are ruled by inalterable and eternal design, which in its effect we may be led to understand, but which in its operation we can neither change nor influence, and the origin of which man must ever reverence as a decree of godly power!

To the Swiss belongs the credit of having initiated the system of agricultural schools, the one established in Hofwyl under Fellenberg originating as early as 1804. Similar establishments arose almost simultaneously in the German empire, under Thaer in Celles, at Moglin (in 1806), and soon subsequently under Schwerz in Hohenheim (1818), further in Schleisheim (1822), in Jena (1826), and flourishing institutions of this kind exist now in many places, through which the achievements of scientific enquiry pertaining to agriculture have found their way for real application into practice. To afford a still higher education from a scientific standpoint in agricultural art, special professorships were created and endowed in the Universities of Leipzig, Halle, Berlin, Göttingen, Giessen, and Munich. In Germany—where educational training is not only as thorough as in any other country, but where also the direction of all kinds of teaching is eminently practical for the development of expansive ideas and a spirit of enterprise—it has been deemed advisable in many instances to combine the teaching for an agricultural career with the working of schools of technology; moreover a general association, which meets in different capitals in different years, is exclusively devoted to the interests of agricultural and forestal affairs. In many other countries similar advancements have been made in agricultural education; and, as you may be aware, a special society for the promulgation of agricultural science has just been inaugurated in the United States, organized much like the American Association for the advancement of science.

The great labors of Baron Liebig and his scientific compeers have led to the establishment of special agricultural stations for experiments, no less than 74 of the present total, 124, being in Germany.

If such were to be established in Victoria, then we have three regions of exceptional distinctness—that of the snowy mountains, that of the forests and the desert.

But let us do justice to earlier periods. The first Agricultural Societies arose in Italy, soon to be followed (in 1723) by one in Scotland, though not of permanency. Three years hence the Royal Highland Society will be able to celebrate the centenary jubilee of its uninterrupted immensely useful existence. An equally brilliant career has distinguished the Royal Agricultural Society of England since its foundation in 1838. Our colonial kindred institutions, though naturally not on such a pretensive

scale, deserve also great credit for the good effected by them amongst our farming population.

In the syllabus of our section the *Tenure of Land* is included; so it may be deemed advisable to offer a few words on this subject. This question so complicated and vexed in over-populated countries in Europe, and there leading to the gravest disturbance of social order, is here so simplified as to need perhaps no discussion at all, were it not for the likelihood of vested rural rights accruing among us in future. Mutual forbearance and kindly co-operation would settle difficulties of this sort much better than rigid legislation, though no doubt cases will arise, when unfortunately the tribunals of the latter must be appealed to.

Equity itself dictates, that the security of property, on which principle largely rests the world's peace, should be held as sacred in regard to land as to any other acquisitions.

If I dare venture in a spirit of fairness and from a common sense aspect to view the tenure-dificulties, it would seem that great landed proprietors abroad might readily endeavour to repurchase the just claims of any enarrowed and discontented tenantry, and thus aid the lessees in an honorable striving for independence by emigration to new countries, where the vastness and cheapness of unoccupied lands give such facilities to establish with comparatively slender means modest and perhaps finally great rural properties. Strong, especially youthful, arms, an earnest will, a thoughtful plan of life, honesty of purpose, frugality and perseverance are bound to succeed with little or even without starting capital in new states or colonies.

Here in Australia, where we are prone to think too much of what concerns our own part of the globe, who can help recognizing, that a great future is augured for us! With three millions of square miles of country, every one of which is sure to be occupied by proprietors before many generations will have passed away, with a clime salubrious and almost free of freezing colds, what may that future be, when viewed in its likely aspects from rural considerations alone. The time will come, when no one will be any longer left in the dark, how to turn his soil methodically to everlasting bearing, when no longer anywhere enormous labour will be wasted in fruitless operations on our fields, when no longer the limpid waters of alpine brooks and forest-springs will flow away largely unutilized into rivers and oceans, when artesian wells and aqueducts—not few but numerous and perhaps like those constructed by Agrippa and Augustus destined to pass through ages,—will maintain an unceasing rural verdure,—when tillage will shed its hundredfold increased treasures in such profusion as to banish altogether poverty, with its dark sequence misery and with its sometimes darker shadow still. Why do we lay particular stress on this? It is as much for maintaining the security of society as the

happiness of the individual! Providence has given to all of us this bountiful world for innocent enjoyment, not for dire distress, has given it for prosperous exertions, not to ill-directed wasteful toil, has given it for permanent strides of progress high aims and noble deeds, not for senseless trivialities nor ephemeral frivolities. There is nothing in nature's laws to prevent on earth a general happiness of the human race, so far as such is attainable within mortal bounds. Tillage must do its share, to bring universally about safe and lasting prosperity. Nourish all classes fairly and you avoid discontentedness of the humbler multitudes. Whatever we do in our individual sphere of life, let us also help to alleviate the burdens of that toiling portion of the community, which mainly works for our actual sustenance and comforts. Provide abundance of food, speed the production of multitudinous kinds of raw material, then manufacture and trade and traffic will follow on their own accord as a sequence. Disregard of these principles, as historic records teach, have more than once overthrown social peace, torn away the pillars of social safety, and shaken many a State to its very foundations!

[*Extract from an Address by Baron Ferd. von Mueller, first Vice-President of the Rural Section of the Social Science Congress, Melbourne. Read November 1880.]*

Introduction of the Arracacha esculenta into India. (Communicated by the Government of India.)

THE Reverend Mr. J. Meyer, of Jamaica, writes in very high terms of an esculent tuber known in the vernacular of the West Indies as Arracacha. He says it requires no water; it flourishes equally well in dry and wet seasons; it gives a much larger yield than the ordinary potato; many people in Jamaica, even among the blacks, prefer it to the yam and the potato; no insect, no blight, nothing seems to interfere with its growth. And he believes that its general introduction into India would go far towards making many of our Provinces nearly famine-proof!

2. If such a result can be attained, it is certainly worth while trying its introduction into this country.

3. Mr. Meyer has, however, not stated what it is essentially necessary for us to know before we take any measures to try the plant here. For instance, he has not said in what altitudes and latitudes the plants can be grown successfully. He has not told us what mode of cultivation is required, and in what season the tubers should be put into the ground. And he has not given any specific figure of outturn obtainable.

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4. Any recommendation for the introduction of any exotics without information on such points is of course useless, unless we are to court failures. Looking, however, into our books of reference, and into some correspondence that took place in 1878 and 1879 on the subject of this esculent, I glean the following information.

5. The Arracacha is a native of the elevated regions of equatorial America, Pasto and New Granada, where the root is largely cultivated as food. It has since a comparatively recent date been introduced into Jamaica. It is called by botanists *Arracacha esculenta*, and is classed in the natural order *Umbelliferae*. In Spanish it is known as *Apio* from the Latin *Apium* (celery), and is in appearance as a growing plant similar to celery, as a substitute for which the tender shoots can be used. It is also described as being somewhat like the hemlock (*Conium maculatum*) ; but its leaves are said to be broader, its stem is dark green deeply striated but not spotted, it is about three feet high, and its flowers are of a dingy purple colour. The roots, which are the object of the cultivation, are large and divided into several tubers, which in shape and size are like short thick carrots, but more oval or rounded and irregular in shape. As food, the tubers are very wholesome and nutritious; and when boiled are firm and have a flavour intermediate between a chestnut and a parsnip. A faecula, analogous to arrowroot, is obtained from the root by rasping in water, as starch is from the potato.

6. The yield in tubers is very large : according to Boussingault as much as 16 tons per acre can be had from land that will not bring more than 9 or 10 tons of potatos.

7. The mean temperature of the Arracacha country is said by Mr. Goudot (who lived there for many years) to range from 64° to 82° . The esculent is cultivated, says Mr. Robert Jreffry, British Vice-Consul at Honda, at an elevation of from 4,000 to 6,000 feet above sea level, the night temperature being from 55° to 65° , and the day from 70° to 80° in the shade. The climate is characterised by being free from the extremes of frosty cold weather and dry summer heat ; it is one of continual moist.

8. The Arracacha requires a deep rich soil, or loose mould, like the potato ; and the ground, if thoroughly cultivated so as to provide a deep friable clef'n bed, will give well-developed roots.

9. Some further useful information is contained in a letter, dated August 1878, from Mr. Henry Birchall (an accomplished English gentleman who has resided many years in that country,) to the British Consul-General, Mr. Charles O'Leary, at Bogota.

10. Mr. Birchall writes that as a large number of sets is produced by one plant, the propagation is rapid. The modus

operandi is thus explained by him, and his explanation is illustrated by diagrams annexed to this note:—

"The propagation of the Arracacha is effected by the separation from the plant at maturity of a number of small peduncle or heads (leaf stalks) spreading from the central root, which also underground throws out the carrot-shaped horns which are the best of the edible part. The hard upper part of the central tuber to which these leaf stalks are attached serves for hogs or cattle as do the leaves for the latter. Above the line in sketch is the hard portion referred to."

11. The planting is done in rows, with a distance of from 3 to 4 feet between each row, and as much between each set in the rows.

"The sets are planted by simply making a hole about 6 inches deep with a pointed stake, and inserting the set slanting with the concave of its curve upward and then treading in the soil slightly, leaving the shoot bit of the stem barely at the surface. The average length of the set, with the small piece of root attached will not exceed 3 to 5 inches. The appearance and position of the set when planted is shown in the diagram or section. The set being broken off, the root should be neatly trimmed to a clean smooth surface."

12. The subsequent operations are thus explained by the same writer:—

"Weeding and earthing up constitute the subsequent culture as often as required. It is customary also when the plant grows large to gather together the leaves and twist their necks moderately—a process said to prevent running to head and favouring development of the root."

13. There does not seem to be any particular season for planting:—

"In favourable situations the planting may take place whenever ground and seed are available. We are always planting Arracacha, and see no particular advantage in one season over another. But the distinction between wet and dry seasons in this country (*Fusagasuga*) is less marked than in some other tropical regions, and probably the close of a well-defined dry season would be the safest period."

14. The plant requires from 10 to 12 months to reach maturity, but the tubers (or carrot-shaped roots) may be gathered two months earlier than this period if much wanted. In this case the produce is of course smaller, but it is said to be equally wholesome and agreeable to the taste.

15. As to diseases properly so called, Mr. Birchall says he knows of none to which the Arracacha is subject:—

"Occasionally when exposed to too much drought it becomes, as it were, frost-bitten called here *chucha* or *enchuchada*, in which state it boils semi-transparent and remains hard after cooking, and is unfit for human food. If, however, plants so affected are allowed to stand till the return of the rains and to renew their foliage, the root will recover."

16. "Manure is never employed for this or for any crop. I can therefore give no opinion based on experience as to its application. But analogy would indicate that, as in the case of all other edible roots, the support and stimulus of manure could hardly fail to produce greatly increased crops. Here all we do is to clear the forest, and plant the Arracacha among the maize, which is the universal first crop."

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17. Some additional remarks are made by Mr. Birchall as to propagation and also transportation which seem worthy of note :—

" Considering the risk and difficulty of transport for the living plants, I venture to suggest the sending of the true seed of the Arracacha if for trial in other countries. The central peduncle of the branch of stalks is never intentionally planted, as it produces the macho or male plant, which proceeds immediately to flower and yields no edible root. This for production of seed is never, so far as I have seen, cultivated in this country; but in every plantation by oversight these flowering plants occur. It appears to be certain that by sowing the seed and proceeding with the resulting plants, which are small at first, exactly as with those produced in the usual way in two or three seasons, the plants will attain their full growth. This is at any rate what experienced farmers tell me, and it may be worth while to try this, for the possible case of failure in those sent in a growing state."

18. Several attempts have been made from time to time to introduce the Arracacha into field culture in Europe, but apparently without success, owing probably to the peculiar climate which it requires, and the great difficulty in preserving the roots through winter. The French made a fresh trial in 1876 to introduce it in the neighbourhood of Paris, but do not appear to have met with any success.

19. Seeing a notice of this trial in the *Gardeners' Chronicle*, the late Revenue, Agriculture and Commerce Department of the Government of India, in January 1877, asked the Secretary of State to procure a few plants for trial in this country. In making the request the Government of India said—

" We deem it preferable that plants should be sent instead of roots, as the former, though more expensive to introduce, are more likely than roots to survive the journey and prove successful to the point of propagation."

20. The Secretary of State accordingly caused an attempt to be made to obtain living plants of the esculent from Bogota, but it appears to have failed, the plants on arriving at Southampton having been found all dead. His Lordship, in informing the Government of India of the failure (in December 1878), added that another attempt would be made, and that Mr. Charles O'Leary had offered to prepare some more plants and bring them with him to England on his return thither. In reply to this the Government of India suggested, in January 1879, that Mr. O'Leary be asked to procure some seed also as well as plants. But before this last communication could reach the Secretary of State, a despatch was addressed by His Lordship to the Government of India, stating that a further supply of the plants were received, which on arrival were sent to the Royal Gardens at Kew. Of these, 12 were alive, but they were not in a condition to bear the journey to India. They were, therefore, kept at Kew, and were sent out subsequently under care of a gardener who was coming out for the Bengal Chinchona Plantations. They reached Calcutta in March 1879, and only two were alive, and Dr. King reported that even these looked sickly. After a few days they were sent to the Chinchona

Plantations in Sikkim under care of the same gardener proceeding there. On the way thither one died, so that only one reached Sikkim. This was kept at Mengpoo (near Darjeeling), and on enquiry Dr. King reported, in June 1879, that this one also died.

21. Meanwhile the seeds asked for by the late Revenue, Agriculture and Commerce Department were received, and were sown in the Chajnri Garden at Mussoorie by Mr. Duthie, who in his Annual Report for 1880-81 on the Saharanpur and Mussoorie Botanical Gardens said that 11 plants were the result, but that "none are sufficiently grown yet to say more of them than that they look quite healthy."

22. Judging from the information brought together in the above paragraphs, it seems probable that parts of British Burma and Assam will be suitable for the growth of the Arracacha; and it may perhaps be considered desirable to make an attempt to introduce the esculent into those Provinces.

L. LIOTARD.

1st June, 1882.

Notices regarding the Japan Pea. COMMUNICATED BY THE GOVERNMENT OF INDIA.

Extract from the Proceedings of the Government of India in the Revenue and Agricultural Department, dated Simla, the 2nd November 1882.

Read the following papers regarding the Japan pea:—

Extract from the Proceedings of a Meeting of the Agricultural and Horticultural Society of India, held on the 2nd September 1881.

JAPAN PEA.

Read a letter from Captain J. H. Pogson, forwarding an extract from an American paper (*Mississippi Patron*) respecting a prolific pea raised in Japan, and suggesting that steps be taken towards obtaining a quantity of this variety for trial in India, which was agreed to.

The following is the extract alluded to:—

"Mr. T. E. Martin and Mr. R. T. Rutledge, both American progressive farmers, state that the "Japan Pea" is the most productive as well as good food that they have ever grown for all kinds of stock; horses, cattle, sheep, and hogs will eat the peas, stems, and leaves, if harvested before fully matured and cured like other hay, with as much relish as they do corn. Then

there is no pea for the table—it is soaked in water the night before cooking—that has a more exquisite flavour. They grow on a stout bushy stalk from two or three feet high, somewhat resembling the cotton plant. The main stalk, as well as the branches of the limbs, are literally loaded with small pea-pods, filled with little yellow peas, similar in colour, size, and flavour to the English garden pea."

As regards cultivation, they state: "But the way to get the greatest yield is to plant in hills two and a half feet each way, allowing but one stalk to the hill to remain after the first working. That will give you 6,960 stalks to the acre, and on ordinary land, cultivated the same as corn, will average at the lowest estimate a pint of shelled peas to the stalk, or a fraction over $108\frac{1}{4}$ bushels per acre. I doubt not that with high cultivation and good soil it would be an easy matter to double that yield, besides there is no other crop that will yield more hay to the acre. In fact, I know of no crop so remunerative as the Japan pea. It is a sure cropper, as clearly demonstrated by my experience with this season's crop. Neither wet nor dry weather materially interferes with the quantity or quality of the yield."

Paper on the Soy Bean by EDWARD KINCH, F. I. E., F. C. S., &c., Professor of Chemistry, Royal Agricultural College, Cirencester.

THE SOY BEAN.

This bean, sometimes known as the Japan pea and China bean, is the seed of the *Soja hispida*, Miquel—(*Glycine hispida*, Moench; *Dolichos Soja*, Linne; Siebold; *Glycine Naja*, Jaquin)—a plant of the natural order Leguminosæ, sub-order Papilionaceæ, and tribe, Phaseolæ. Its natural habitat appears to be China and Japan; it also grows in Mongolia, and in India in the Himalayas, and within the last few years it has been cultivated experimentally in several European countries. This bean is worth more than a passing notice, as it is the vegetable which approaches most nearly in its proximate chemical composition to animal food. This will be seen later on.

There are a great number of varieties of the soy bean known, which differ to some extent in the shape, size, and especially in the colour of the seed, and in a few minor particulars, but which seem to vary comparatively little in chemical composition. Dr. C. O. Harz has classified the principal varieties as follows:—

Group I.	<i>S. hispida platycarpa.</i>
(1)	<i>olivacea.</i>
(2)	<i>punctata.</i>
(3)	<i>melanosparma.</i>

(a)	<i>vulgans.</i>
(b)	<i>nigra.</i>
(c)	<i>renisperma.</i>
(d)	<i>rubro-cincta.</i>
(4)	<i>platysperma.</i>
(5)	<i>perrula.</i>

Group II. *S. hispida tumida.*

(6)	<i>pallida</i> (Roxburgh.)
(7)	<i>castanea.</i>
(8)	<i>atrosperma.</i>

These names sufficiently indicate the nature of the variety as far as the seed is concerned.

The soy bean is extensively cultivated in the north of China, whence it is exported to the southern provinces; it is here pressed for the sake of its oil, and the residual cake largely used as food for man and beast, and also as a manure.

In Japan it is known by names signifying THE bean, and from it are made not only soy but a paste, known as *miso*, which is in constant request at nearly every meal, *tofu* or bean cheese, and other foods used to a less extent. This bean cheese is also well known in China, and is obtained by extracting the legumin from the beans with water and precipitating it with brine. An analysis of it is given below.

These foods are most valuable additions to the dietary of the Oriental nations, and especially of the Japanese, who use so little animal food; they tend to supply the deficiencies of the staple food, rice, in nitrogenous matter, fat, and also in mineral constituents.

The Buddhist priests, who are strictly forbidden the use of animal food, consume considerable quantities of these beans, principally in the form of *miso*.

The soy bean first attracted attention in Europe in the year 1873, when specimens from Japan, from China, and from India were shown at the Vienna International Exhibition. Dr. Forbes Watson, Reporter on the products of India, called attention to it in the catalogue of the exhibits of the India Museum. Since then numerous experiments have been made on the European continent on its growth, and also feeding experiments with the bean and its straw on different kinds of animals have been prosecuted. Such experiments have been carried on by Woolling and Wein at Munich; by Harberlandt, Lehman, Harz, Stahel, Zimmerman, Siewert, Wieske, and others at various stations in Germany, Austria, and Hungary; and experiments have also been made in France and in Italy.

The proximate chemical composition of some of the different varieties, grown in different places, is now given and compared

Notices regarding the Japan Pea.

with the composition of some other foods of vegetable and animal origin :—

Percentage Composition of the soy bean.

	Pale Yellow.	Brown.	Round black.	Long black.
	Japan.	China.	Germany.	India.
Water	11.3	9.0	9.5	12.0
Nitrogenous matter	37.8	32.0	34.5	36.0
Fat	20.9	18.0	18.0	18.0
Carbohydrates	34.0	32.0	28.5	30.0
Fibre	2.2	4.0	4.5	4.0
Ash	3.8	5.0	5.0	4.0
	100.0	100.0	100.0	100.0

It has been shown by Levallois (*Comptes Rendus*) that the soy bean contains a special variety of sugar, in many of its properties resembling mellitose; this constitutes about ten per cent. of the soluble carbohydrates. Of the nitrogenous matters nearly all is in the form of albuminoids; a small quantity, about 1 per cent., appears as a peptonelike body, and about 1—2 per cent. is non-albuminoid.

Percentage Composition.

	Pear.	Beans.	Lupins.	Lentils.	Lean Beef.	Fat Mutton.
	100.0	100.0	100.0	100.0	100.0	100.0
Water	14.0	14.8	12.2	12.5	72.0	63.9
Nitrogenous matter	23.0	21.0	24.3	25.0	19.0	12.0
Fat	1.7	1.6	5.0	1.8	4.0	32.0
Carbohydrates	53.8	49.5	36.4	54.6	...	...
Fibre	5.0	7.0	4.1	3.6	...	...
Ash	2.5	3.1	4.0	2.5	5.0	3.0
	100.0	100.0	100.0	100.0	100.0	100.0

These analyses show the greater richness of the soy beans in nitrogenous matter and in fat than the common bean and pea, and that, when the water is equalised, it more nearly approaches meat and proximate composition. The only leguminous seed, of common occurrence, which contains more oil than this bean, is the earth nut or ground nut *Arachis hypogaea*, which is now so largely cultivated abroad for its oil and its cake. In order to compare the soy bean straw with hay and with other straws of like nature, the following average analyses are given :—

	Meadow hay.	Bean straw.	Pea straw.	Lentil straw.	Soy bean straw.	Soy bc hulls.
	100.0	100.0	100.0	100.0	100.0	100.0
Water	14.0	16.0	15.0	14.5	11.3	10.2
Nitrogenous matter	8.2	10.0	7.0	14.1	7.8	6.0
Fat	2.0	1.0	2.0	2.0	2.2	1.5
Carbohydrates	39.8	34.5	34.0	26.4	41.6	43.0
Fibre	30.0	34.0	38.0	36.6	24.9	31.0
Ash	6.0	4.5	4.0	0.4	12.2	8.3
	100.0	100.0	100.0	100.0	100.0	100.0

A special variety of the *soja hispida* is cultivated in some parts of Japan as a fodder crop, and cut just as the pods are

fully formed. The hay made from this is much relished by horses, cattle, and sheep. A sample of a crop grown on the Imperial College of Agriculture Farm, Komaba Tokiyo, gave on analysis:—

Water ..	..	..	..	..	..	15·0
Nitrogenous matter ..	..	..	..	..	..	19·8
Fibre ..	..	..	..	..	..	35·9
Ash ..	..	..	..	..	..	6·8
Carbohydrates and Fat ..	..	..	..	..	..	22·5
						100·0

It will be seen that this hay exceeds even lentil straw in the amount of nitrogenous matter it contains.

The following are means of various analyses made in Japan of food products obtained from the soy bean, and which are largely consumed there:—

Percentage Composition.

	White miso.	Red miso.	Bean cheese.	Frozen Bean cheese.
Water ..	50·7	50·4	89·0	18·7
Nitrogenous matter ..	5·7	10·0	5·0	48·5
Fat ..	..	24·4	18·9 {	3·4 28·5
Carbohydrates ..	..	..	2·1	2·6
Fibre ..	12·6	8·2	..	..
Ash ..	6·6	12·5	5	1·7
	100·0	100·0	100·0	100·0

The ash of the miso consists mainly of common salt which is added in the process of manufacture.

The ash of the soy bean was found, as a mean of several samples, to have the following percentage composition. The composition of that of the straw is also given:—

	Soy bean ash.	Straw ash.
Potash ..	44·5	15·4
Soda ..	1·1	2·2
Lime ..	5·6	44·2
Magnesia ..	9·1	15·4
Ferric oxido ..	·8	·8
Chlorine ..	·2	·2
Phosphorus pentoxide ..	82·7	9·4
Sulphur trioxide ..	6·0	6·4
Silica ..	..	5·5
	100·0	99·5

The crop takes from the soil a large amount of the valuable mineral constituents, phosphoric acid and potash, as well as a large amount of nitrogen.

The results of the German and Austrian experiments show that where the temperature is not too low, the results of the harvest as compared with that of ordinary beans or peas is exceedingly satisfactory.

The kinds most suited for cultivation there are the yellow, brown, round black, and long black varieties, *i. e.*, *pallida*, *castanea*, *atrosperma*, and *melanosperma*, especially the first three named. They require a vegetation time of about 150 days, dur-

ing which the average temperature must be about 58° F. (14.3° C.), and the sum of the heat (the average temperature multiplied by the number of days) about 2,100° C. They may be sown in the beginning of May, and harvested the end of September or even the beginning of October.

The seeds should not be sown deeply, not more than 1 to $1\frac{1}{2}$ inches deep, and about 18 plants to the square yard may be left after weeding and thinning out. The plants grow to a small bush about $2\frac{1}{2}$ feet high, and produce pods with two, three, and occasionally four or even five seeds. The most suitable soil is a peaty soil, or one containing a good deal of organic matter, and the next most favourable is a calcareous soil. Nitrate of soda has been found to be a good manure for the crop in Germany, and also potash salts, especially potassium sulphate. Ammonium sulphate did not give so good a return as the same amount of nitrogen in the form of nitrate; on soils poor in organic matter it would probably be better to supply the nitrogen in some organic combination, such as rape cake, shoddy, and the like. Phosphoric acid, especially as di-calcic phosphate, was a help on some soils.

Field experiments made by myself on this crop in Japan showed that wood ashes had a good effect, and that anything like an excess of nitrogen in the manure was very harmful to the yield of grain: in that country the plants are often sown on the dividing ridges between the plots of paddy and without any manure. The yield of seed and straw in the German experiments compares very favourably with that of beans and peas grown under the same conditions: from 2,000 to 3,000 lbs. of seed and 5,000 to 10,000 lbs. of straw per acre have been obtained.

Feeding experiments with the produce have been made with pigs, sheep, oxen, and milk cows, and with very good results. The bean is a most excellent addition to other foods, especially such as are deficient in nitrogenous matter and fat. The digestion co-efficients of the nitrogenous matters, of the fat, and of the total non-nitrogenous matter in the soy bean, and also in the cake left after its pressure for oil, closely approximate to 90 in each case. As a mean of two direct experiments with soy bean straw, the digestion co-efficients were found to be as follows: Nitrogenous matter 60.8, fat 63.2, fibre 33.6, and non-nitrogenous extractive matters 69.0. The huds are rather less digestible.

The albuminoid ratio in the beans is about 1 : 2.3, in the straw 1 : 8.1, in the huds about 1 : 20, and in the cake 1 : 1.3.

An analysis of the cake shows:—

Percentage Composition.

Water	13.4
Nitrogenous matter	40.8
Fibre	5.6
Carbohydrates	28.1
Fat	7.6
Ash	5.2
	100.0

In good condition it would be a valuable addition to our feeding cakes, but it is too highly valued in the East to enable it to be imported to any extent at a profit.

The soy bean plant has considerable power of resisting unfavourable climatic influences as cold, drought, and wet; and appears to be particularly free from insect attacks, and indeed from all parasites; this last, if it continues, is by no means a slight advantage. The soy beans are eagerly bought by the natives of Southern Italy, an almost vegetarian race. That they are easily digested I can speak from experience, having frequently used them on my table cooked after the manner of haricots. Taking into account the great richness of these beans in valuable food constituents, their easy digestibility, the value of the straw, and the great probability of some variety being able to be acclimatized without great trouble, this *soja hispida* is worth consideration. The bean would form an exceedingly useful addition to the food of the poorer classes, as a substitute for a portion of the animal food which in the kitchens of the labouring classes is so wastefully cooked. One use it has already found, not altogether to be commended, viz., after roasting, as an adulterant of, and substitute for, coffee.

We have procured seeds of several varieties direct from Japan, and of one variety from Germany, and these are now being cultivated in the botanic garden. They were sown rather late, and the month of June has not been favourable to their growth, but some of the varieties promise fairly.

No. 1853, dated 11th October 1882.

From J. R. REID, Esq., Offg. Secy. to Govt., North-Western Provinces and Oudh; to the Secy. to the Govt. of India, Revenue and Agricultural Department.

In reply to your letter No. 119 A. and H., dated the 18th Feb-

From Superintendent, Botanical Garden, North-Western Provinces and Oudh, No. 2406, dated 20th September last, I am directed to submit, for the information of His Excellency the Governor-General in Council, a copy of the letter noted on the margin, containing a report on the cultivation of the Japan pea in the Mussoorie and Chajuri gardens.

No. 2406, dated Saharanpur, 20th September 1882.

From J. F. DUTHIE, B. A., F.L.S., Superintendent, Government Botanical Gardens, North-Western Provinces and Oudh; to the Director, Department of Agriculture and Commerce, North-Western Provinces and Oudh.

In reply to your No. 1227 A., dated 1st instant, I have the honour to forward a report received from the Native Overseer on the cultivation of the "Japan pea" at Mussoorie and

Chajuri. This plant appears to be nothing more than an improved variety of a commonly cultivated hill pulse called "bhat" (*glycine soja*) or soy bean.

About three years ago I received seed of the same plant from the Director of the Oriental Museum in Vienna, together with high recommendations regarding its value as a source of food, an opinion borne out by the very large proportion of nitrogenous substances contained in the seed (see Baden-Powell's Punjab Products, Volume I, page 243.)

Three pounds of seed were sent to the overseer for sowing in both gardens.

At the Mussoorie garden one pound was sown on the 12th March last, and not a single seed germinated.

Cultivation at Chajuri.

Weight of seed ..	..	..	2 lbs.
Date of sowing ..	..	..	28th February and 6th March 1882.
Area of ground ..	..	..	36 feet x 12 feet.
Weight of manure ..	..	..	12 maunds.
Proportion of seed which germinated ..	..	..	About half.
Date on which the ripe seed was collected ..	..	..	25th July 1882.
Weight of seed produced ..	..	..	2 lbs. 12 oz.

OBSERVATIONS.—The Government of India desires that the cultivation of the Japan pea should be extended in this country, and in this view it is suggested that further experiments should be made in suitable places. A fresh supply of seed will be procured from Japan for distribution to such Local Governments and Administrations as may wish to try the experiment.

The Government of Madras.
" Bombay.
" Bengal.
" North-Western Provinces
" and Oudh.
" Punjab.
The Chief Commissioner, Central Provinces.
" British Burmah.
" Assam.
" Ajmere.
" Coorg.

The Secretary for Berar to Resident at
Hyderabad.

ORDER.—Ordered that a copy be forwarded to the Local Governments and Administrations noted in the margin for information.

Ordered also, that a copy be forwarded to the Honorary Secretary, Agricultural and Horticultural Society of India, with a request that the Government of India may be informed whether the Society would like to try any experiment with the Japan pea.

Utilization of Flax Stalks for paper-making purposes.

FARMERS will be glad to hear that there is a fair prospect of a new industry for them. From careful experiments made in the south a new use has been discovered for the flax plant. The flax is sown in fallow and in clean land instead of a wheat crop, when

it is within ten days of being fully ripe the flax is pulled and dried in the straw as if it were oats. Then it is stacked in the usual way. When convenient the rippling is done. This process used in Scotland to be done by two men, who sat facing each other on a plank. Fixed between them was a coarse heckle, called a "rippling cæme." The flax straw was sharply drawn through the heckle, and the golden bolls fell in a rich heap on the floor. A quicker and cheaper process will, no doubt, be devised. It would seem that farmers, however, have devoted far more attention to implements for grain than for fibre. Well, when the seed is thus removed the fibre is sent, not to be steeped, not to the lint mill, but to the paper mill. The price given for the straw is £4 10s. per ton. The paper-maker steeps it, and then grinds it all up, wood and fibre together, and the result is paper of a superior quality. Experiments have shown that from £14 to £16 an acre is not at all an unreasonable expectation from this simple crop. The farmer gets rid of the costly and difficult process of steeping and drying the fibre. He gets it off his hand at once. It is a low-price article, and freights must always give the farmer on the spot a great advantage over a rival who has to pay them upon an article so low in price. No farm where linseed is abundant can fail to grow richer. Every living creature thrives. The poultry grow, and they lay with linseed feeding as with no other food. Linseed boiled with the inferior barley, gives a feed for horses which soon makes their skins shine; and if used with moderation, and specially with regular feeding of cut oats, it cannot be surpassed. Than oats from the stack—grain and straw cut into chaff, with boiled linseed and barley—two or three times a week, nothing can be better. No farmer needs to be told the effect of linseed on feeding cattle. But especially on milk cows is the advantage of the use of linseed most manifest. Where, as in Russia, we have long winters, milk, cream, and butter of uniform excellence can be produced, and are produced, all the year round by those in the secret. An old Scotch gentleman, long resident in Russia, used to describe the way linseed is used there. At night the cook takes a big handful, puts it in a shallow pan, fills it with water, and sets it on the stove. In the morning when she goes to milk she sets the pan before the cow, and as a result of this, even in the depth of a Russian winter, milk, cream, and butter in perfection are abundant in the household. Then the manure, as every farmer knows, where good cake is largely used, is also altogether different. If much linseed is consumed on a farm the land will soon get into good heart. It is true that a large flax crop is exhausting to the soil. But so is any large white crop. But if the linseed is used on the farm to any considerable extent, then no crop is better for laird and tenant. No doubt flax is prescribed in many leases, but landlords should in these times

28 Utilization of Flax Stalks for paper-making purposes.

be the last to interfere with an experiment like this. The manufacture of paper seems to be even yet but in its beginnings. Bags of paper, strong as hessian, and far more perfect for seeds or other produce, would be used if fibre could be got at a reasonable price. Flooring and furniture, decorations for walls, panels for carriages, and a thousand articles can be made from paper. Surely an experiment so likely to lead to the relief of the farmer, and to benefit the whole country, is well worth trying; and, as this is the very season for sowing, no farmer could be far wrong in risking an acre or two acres. In every case care should be taken to measure the ground, and exact notes should be made as guidance for future cropping. There is this crowning advantage in a flax crop to be used for paper, that even if not harvested in perfect condition, or discoloured by rain in harvest, it would not be altogether useless. From every point of view this thing is worth a trial.—*Extract from Dundee Advertiser.*

THE COTTON SEED OIL INDUSTRY.

Speaking of the new era of prosperity for the South, Commissioner Kenner, of Louisiana, of the United States Tariff Commission, said to a reporter lately:—

“ I made the prediction five years ago, and the present state of the business justifies the prediction, that the manufacture of oil and other products from cotton seed would within twenty-five years bring from one-fourth to one-third to the South of what our section then got from the staple itself. This would yield an increase in revenue of probably not less than \$100,000,000. The business has entirely grown up since the war, and it is only within the past ten years that it has attained any importance. There are now sixty-five or seventy mills in operation or being erected, and the progress and profits of the manufacture are already established. When the chief mill in New Orleans was established some ten years ago we paid but from \$7 to \$10 a ton for the seed. Last year we were obliged to pay from \$16 to \$19 a ton. At first we could get such a supply as we wanted along the watercourses, and the transportation cost but little. The demand has grown to such proportions that we must now go into the interior, and the difference in the cost of getting the seed to market makes the difference in the prize to us.

“ For every bale of cotton—400 pounds—there are 1,200 pounds of seed. The annual cotton crop amounts to about six million bales, which would yield, after reserving the necessary seed for planting next year, about two and a half million tons of cottonseed. This seed if manufactured into oil, oilcakes and other products, would be in value not less than \$75,000,000, and

probably \$100,000,000. All of this seed before the war, with the exception of that used for planting, was thrown away. We now buy all that we can get. With increased facilities of transportation, permitting the planters to ship their seed to the mills, the entire crop will be utilized, because the profits of the manufacture, with the price at not more than \$20 a ton delivered at the mill, will induce the expansion of the business until the whole crop will be used. There will be always a ready market. All that is now made is readily sold. There are four products of the seed—the oil itself, lint necessarily left on the seed in the process of ginning, the cake and the residuum left after clarifying the oil. The oil is used for table purposes and for cooking; the oil cake for feeding animals and for fertilizers; the residuum for soap stock. Out of one ton of seed we get thirty-six gallons of oil and about seven hundred pounds of cake, besides the lint and residuum. The total value of the manufactured product yields a very handsome profit. Our markets for the oil are Italy and the Mediterranean ports; for the cake, England and Germany. Of course, large quantities of both are also consumed in the United States. Good judges declare that where cottonseed oil is well made and clarified it is hard to tell the difference between it and the best olive oil. Both are vegetable products, and there can be nothing purer or more free from injurious effects upon the stomach than is cottonseed oil. I have no doubt that the time will come when it will be used with fully as much savor as the salad oil from Europe. It is now used by thousands who cannot detect the difference between it and olive oil. I look to its manufacture as one of the great factors of the future prosperity of the South.”—*Oil and Paint Review.*

COCOA (CACAO) CULTIVATION IN CEYLON.

I MAY briefly mention what I consider necessary to successfully grow a Cacao clearing. In the first place, when felling jungle, care must be taken that only the small jungle is cleared, and the big trees allowed to remain. 2. I have been most successful when sowing the seed in small bottomless clay pots about 6 inches in height, and putting out the plants with the pots before the taproot has struck the ground. After the plants looked as if they had established themselves, I had the pots carefully broken and removed without giving the plants a shock. As by this method I lost barely 20 per cent of the plants, I think I may safely ask planters to give this system a trial. I have heard it suggested by one who cultivates this product, that the pots had best be ordered in halves, like ordinary house tiles (small) and tied together by piece of tarred coir rope. This

method is more economical, as the pot could be removed and used again by simply severing the rope. 3. After the plants have fairly established themselves, that is, after a fair percentage have passed their second year, I think it will be best not to remove the shade at once, as the sudden change will either kill the plants or force them to over-bearing, but to gradually thin out the shade trees from year to year till it is found necessary to entirely remove them by ringing. 4. Not only in the cultivation of cacao, but in the cultivation of any product in the low-country, I think it unwise to weed clear as in the hill country. I did not come to this conclusion recently or after reading Mr. Warington's remarks on the loss of nitrates by the soil when prosecuting a clear surface; but after observing the condition of a piece of ground cultivated with Liberian coffee which had been thoroughly piked, after a few showers and a week of hot, scorching sun, it will hardly be believed, but it is nevertheless a fact, that the ground became so caked or hard, that weeding with a mamotie became difficult! I have now the ground in such a state of weeds, that by the time one end is being weeded, the other is a carpet of weeds. This certainly is not pleasing to the eyes of those accustomed to weeding on coffee estates, but appearance must be sacrificed to utility. As a result of this system of weeding I may be allowed to mention that the coffee is flourishing, and I have now a fine friable mould from the decomposing weeds, instead of a hard-baked soil.

In conclusion I may make mention of a system of terracing I saw on Palekelly. After observing the system I have adopted it and entirely stopped wash. It is only practicable where the lining has been done in squares, and on moderately undulating land. Light weeding hoes are used in weeding, and the weeds and soil heaped in line from tree to tree. Squares are thus formed having the trees at the angles. I have found from experience that if the banks are about 6 inches high and well bound with weeds, the squares retain all the moisture dropped by monsoon showers.—B. in *Ceylon Examiner*.

THE UTILIZATION OF WASTE.

LET us pass now to vegetable substances, and I will first consider the paper manufacture. A recent estimate was published, which set down the paper mills of the world at 4,000, producing 1,000,000 tons of paper, of which the half was used for printing.

The quantity of paper of different kinds now made in the United Kingdom probably exceeds 350 million pounds annually. The newspaper press alone has made enormous strides, to say nothing of books, periodicals, and other printing demands. A

quarter of a century ago, there were scarcely twenty or thirty daily issues of newspapers in the Kingdom; now there are at least 140, many of them papers with very large circulations.

In 1856, we received but 10,284 tons of rags for paper-making from abroad; in 1881, we imported 26,773 tons. Esparto grass was only introduced to any extent in 1861, when 891 were received. In 1881, the imports had risen to 192,493 tons, valued at £1,286,211. Besides this, we also imported 45,550 tons of wood-pulp and other paper-making substances.

It is now evident that the future of the paper industry will, in a large degree, depend upon the use of wood, which is already so extensively employed. For the ordinary varieties of paper, ground wood is used; but for the finer sorts, chemically prepared wood-fibre, or cellulose, is employed. The practical process for the preparation of cellulose was discovered in 1852, and numerous other processes or improvements have since been invented. It comes into commerce in two forms—wood-pulp in sheets or blocks, and ligneous meal or wood flour.

In Central Russia, aspen wood is most extensively employed; in Sweden and Finland, spruce and fir, which afford the longest fibres; in Germany, France, and Belgium, mixed woods. The pulp from beech and birch woods has too short a fibre.

About twenty years ago, some of the American papers used the bamboo largely for making paper. This is no new application, for the Chinese have long employed it for a common description of paper. Of late years, however, Mr. Thomas Routledge, of the Ford paper mills, Newcastle, who was the first to utilise extensively esparto grass, has prosecuted extensive researches and inquiries, so as to extend the supply of this excellent paper material. It may be mentioned here, that the number of the Society's *Journal* (Nov. 28, 1856) containing Dr. Royle's paper on Indian fibres, was printed on paper made by Mr. Routledge, entirely of esparto.

The fibrous stem and leaves of the plantain, which is so plentiful in most tropical regions, have not yet been practically utilised, although efforts were made some years ago in British Guiana by a company. Dr. King, the Colonial Botanist at Calcutta, recently reported:—"It has been found that, during the dry months, simple exposure of the sliced stems to the sun is sufficient to prepare the fibre for paper-making, provided the paper mill be on the spot. What is still wanted is some cheap mode of removing the cellular tissue, so that the fibre may be shipped to England without the risk of fermentation on the voyage."

A good deal of the jute sent from India to the United States consists of the dark root, or butt-ends of the fibre, which are cut off when the jute is pressed into bales. These are called

"cuttings" in Calcutta, and with us, "rejections;" they now form a regularly quoted article of export to America, where they are employed in the fabrication of various shoddy-stuffs. In former years these cuttings were thrown away.

The *Dundee Advertiser* of the 14th May, 1873, was printed on paper made from jute, and in the issue it was stated:—"This is the first paper, as far as we are aware, ever printed on jute. Being in the centre of the jute manufacturing district, we have been anxious, for some time, to print on the material which has now become the staple of our local manufactures, and we are indebted to our principal paper-maker, Mr. D. M. Watson, of Bullionfield, for carrying out our wishes. It may be explained that this sample is made almost entirely from old jute bagging." To some extent, jute bagging and waste have now been used by paper-makers for several years.

Other waste substances are coming into use with the paper trade, where obtainable in quantity and cheap. Megass, the refuse stalk of the sugar-cane, makes excellent paper. The husks of oats, barley, rye, and rice, are also used alone, or combined with other materials.

Straw-board, of late years, has been found to be a cheaper material than the old-fashioned "pasteboard," and it has come extensively into use in America for paper boxes. The annual product of straw-board in the States is from 35,000 to 40,000 tons.

Straw has long been employed as a paper material, but it is often scarce and dear. It is even found profitable to buy up the bedding litter from the metropolitan stables, and, after washing and disinfecting it, to sell it to the paper mills. The last United States census (1880) showed that more than 270,000 tons of straw were used for paper.*

By the patent process of Chadwick and Clench, the carbonate of soda is recovered from the waste liquors, resulting in the reduction of fibrous materials, when manufacturing paper pulp from straw, esparto grass, hemp, jute, and other fibrous materials.

* The whole materials used were:—	lbs.
Straw	540,843,600
Rags	413,417,400
Old paper	193,248,000
Manilla stock	186,529,200
Cotton-waste	26,593,600
Corn (maize) stock	2,098,100
Esparto grass	580,800
	1,363,311,400

This is exclusive of the wood-pulp consumed.

In a paper read last year before the Scottish Society of Arts, by Mr. G. J. Wishart, on the recovery of soda from the spent lye of the paper-maker, he observed:—

"The industrial progress of recent years has in no direction been more marked than in the utilisation of waste materials. New industries have thus been created, and old ones rendered more profitable, while grave public nuisances have, in many cases, been removed or abated."

"Were it not for the bye-products obtained from what was once considered waste in the manufacture of paraffin oil, it would be impossible for the manufactured oil of this country to compete with the ready-made article of the American wells. By a similar utilisation, gas—the product primarily sought for in the distillation of cannel coal—can, it is said, be manufactured free of cost; while, in the paper industry, the chemicals employed in the process of converting esparto and other raw fibrous substances into paper pulp are now, to a large extent, recovered, and are thus kept out of the streams they formerly polluted, to the manifest profit of the manufacturer, and the satisfaction—so far—of riparian proprietors."

Until a very recent period, the waste paper of the Government offices of London was the perquisite of the messengers. But when it was found that the aggregate sales of this waste paper reached the sum of £10,000 to £15,000 a year, it was thought time to look into this, and it was then handed over to the Stationery-office, and, in the last financial year, the sale of waste paper reached £11,771. Unfortunately the Government printing is very lavish, every member receiving about a ton weight of Parliamentary documents yearly. The United States Treasury sells yearly more than 600 tons of paper pulp, resulting from the destruction by maceration of Government securities, bank-notes, &c.

In one large printing and publishing establishment in the metropolis, the waste paper in shavings and imperfect impressions exceeds 75 tons a year. Even the newspaper offices now economise and use up their spoiled impressions or overplus papers for printing their posters on.

I might enlarge upon the extension of the trade in fibrous substances, formerly waste, used for brushmaking, such as kittool, piassaba, Mexican grass, &c.; but there is a gentleman present who can supply better information, as he was the first to introduce them.

It is only since 1860 that the extraction of the oil from cotton seed has been carried on on a commercial scale; before that date vast quantities of the seed were allowed to accumulate and to rot on the cotton plantations. It is an industrial fact of considerable interest and significance, that at the present time the seed is often more valuable to the planters for its oil and oil-cake than the cotton fibre, for of the latter it contains only about one quarter of its weight.

Decorticated cotton cake, largely used for cattle food, is of a pure yellow, and is made only in England and America. The

seeds are crushed in the decorticators, and the husks removed from the kernels by winnowing. The kernels are next ground and made into cake in the usual way. The husks are utilised in paper-making. If the oil is to be used for industrial purposes, the cakes are hot-pressed; but oil for table use is always obtained by pressing in the cold.

The total production of cotton seed in the United States has been estimated at more than two and a-quarter million tons, but there are other sources from whence supplies are drawn, such as Egypt, Brazil, and India. Not many years ago, our imports of cotton seed into the United Kingdom were only 80,000 to 100,000 tons. In 1881, we received over 232,000 tons, of the value of £1,783,109.

In France, large supplies of cotton seed are received from Turkey, Egypt, and Italy. Marseilles and Rouen are the leading towns in which the seed is crushed, and the oil, so expressed, is used by painters, varnish makers, and soap manufacturers; combined with other oils, it is used for lubricating and now also extensively as a substitute for lard for household purposes.

It is stated, in an American paper, that there are now in operation in the Southern States, sixty-seven cotton oil mills, and the price of cotton seed has advanced from six to twelve dollars per ton. Over £500,000 worth of oil was manufactured last year; this, however, is declared to be but a mere fraction of the value of the whole crop, were it all utilised. The American cotton crop, of last year, produced about three million tons of seed. Of this, no more than 180,000 tons, or one-sixteenth of the whole, were crushed. The 2,800,000 tons which went to waste, would have produced ninety-eight million gallons of crude oil, worth forty cents. per gallon, or more than £8,000,000 in value.

In the process of refining, the residue of the crude oil is distilled, and, with care, produces a hard grease or stearine, which commands, when of good colour, within 3s. or 4s. per cwt., the price of Petersburg tallow. This bye-product is used for making artificial butter. Even the soots, or tarry residue, is useful as a paint ingredient. Cotton seed oil is now largely mixed with olive oil. Its presence may be recognised by treating the oil with nitric acid; on shaking it, a coffee-brown colour will be seen if cotton seed oil is present.

Although the olive is a most important product of Italy, Greece, and some other countries, the means generally employed for extracting the oil were very imperfect, and led to considerable waste of oil. After the olives had been crushed by the peasants, the husks were abandoned as worthless. Until the last seven or eight years, the residue from the oil presses was either used as manure, or more usually burnt as fuel. It was

largely exported from Corfu to Malta, where it fetched remunerative prices, being used by the bakers to heat their ovens. The accumulation of this material in the Ionian Islands had become enormous, in spite of the local consumption, when it occurred to some one to analyse it, with the view of turning it to some useful account, and it was then found to contain a large per-centage of useful oil. At Corfu alone, from 350 to 400 tons of this oil, extracted by bisulphide of carbon, is now shipped to Marseilles, and used for soap-making. The crude product, freed from the nuts, contains about 25 per cent. of fatty matter, and the cake, as received from the press, with the nutshells still in, contains about 13 per cent. of fatty matter. The husks are now imported in large quantities to Marseilles, where, by chemical means and a steam press, 20 per cent. of oil is obtained. The nuts of the olive, which were formerly thrown away, now yield, in Greece alone, oil to the value of £20,000. These improvements have been effected within the last 15 years. At Tunis, small bits of the olive skins, after the oil has been extracted, are mixed with wheat and barley, and made into bread.

On the West Coast of Africa, in the production of palm oil from the fruit or drupes, the kernels were formerly thrown away, now they are cracked by hand with stones by whole villages. In 1863, it was found profitable to collect and ship them for the oil, of which they yield about 30 per cent. From the single port of Lagos about 45,000 tons of these kernels are shipped, valued at £300,000; from Sierra Leone 10,000 tons, and other quantities from the Gold Coast. It has been estimated by competent authorities that, from the 50,000 tons of palm oil shipped from Africa, there must be 223,000 tons in weight of kernels, which would yield as much more oil as is already shipped. In fact, a competent authority, Mr. C. Sevin, of the "Palm-nut Oil Mills," estimates that we ought soon to get 400,000 tons of palm-nut kernels from West Africa. The marc, or residue after the expression of the oil from nuts and seeds, if not exactly a refuse material, is at least a secondary product in the manufacture, which possesses considerable value, and has become a large article of commerce for feeding stock and manuring land. Among the oil-cakes chiefly used for cattle-food, are linseed, rape-seed, decorticated cotton-seed, ground nut, and cocoa nut;—mustard-cake, rape-cake, castor oil-cake, undecorticated cotton-seed, and some others are used for manure. Besides the quantity of oil-cake made at home, we imported, in 1881, from abroad, 221,100 tons, of the value of £1,764,492.

One of the raw materials, the most abundant in the production of alcohol, is the molasses from beet sugar. The quantity of molasses annually produced on the Continent is estimated

at 250 millions of kilogrammes. Of the 30 parts of non-saccharine matter $5\frac{1}{2}$ per cent. are potash, and $1\frac{1}{4}$ to 2 per cent. of nitrogen. It was only in 1853 that the distillers first entered on the production of alcohol. The molasses, after yielding alcohol, leaves as residue a brown aqueous liquor known as "vinasse." This, evaporated and calcined by heated air in special furnaces, furnishes the saline of beet-root, which is one of the most important sources of potash in France. The pulp of the beet-root is largely used for feeding cattle; its value, however, varies according to the process by which the sugar is extracted. The ordinary process is by pressure, the other by diffusion. In the first case, the roots being submitted to rasping, the cells are torn, and the saline and albuminoid matters are mixed up with the sugar in the juice by the action of the press. In the second case, the cells are preserved intact, the beets being cut into thin slices, which are treated with tepid water. The residues from diffusion are almost free from sugar. If in the dry states, they are more rich in albuminoids. About 5 lbs. of this pulp is given daily to a sheep, and 50 lbs. per head to cattle, in admixture with other food. The pulp is stored for preservation in trenches or silos, and for this purpose it is mixed with about one per cent. its weight of salt, to prevent it from entering into putrefactive fermentation.

There are upwards of 40,000 brewerites in the United Kingdom alone, to say nothing of the large numbers on the Continent. The best use of the bye-products of the brewery is that of the grains for cattle-food. As this is very subject to decomposition, various systems and apparatus have been invented to preserve the grains. The old-fashioned plan of pressing them into pits or a large tank, with the addition of some salt, in order to preserve them for a time, is well known; but this is not practicable if the grains have to be carried great distances. In 1874, Mr. Henry Chapman took out a patent in America, for compressing, salting, and drying the grains, and thus making them into a novel and saleable article of commerce. Upwards of three million bushels of malt are brewed in New York and neighbourhood every year, which yield 16,500 tons of dried grains.

The marc, or residue of hops, according to Boussingault and Payen, contains $2\frac{1}{2}$ of nitrogen dry, and about .56 wet. From the residue of distilleries from maize by the filter presses and heated cylinders, a large quantity of burning and saponifiable oil is now obtained, and also feeding cakes for cattle, of equal value to those from earth nuts.

Take another instance of utilisation in dried yeast; not only is it an important article of import with us from the Continent —206,000 cwt., exceeding £542,000 in value—but it has be-

come an extensive industry in many countries. In Russia, the value of the pressed or dried yeast annually consumed is officially stated at 250,000 tons. They also import about 20,000 cwts. to 22,000 cwts. from Germany and Austria; twenty years ago the import was only 10,000 cwts. A dried yeast is also made from maize in Baden, which differs from the rye yeast of Hanover and Hesse, the compressed beer yeast of France, and the dry yeast of Bavaria, in that it keeps better, and contains a more regular ferment, which renders the bread lighter and of a better taste.

There is one product of the United States which, although scarcely a waste one, is very difficult to use up profitably; that is, maize or Indian corn. This staple crop increases so rapidly that use can hardly be found for the whole of it. Its principal application is for fattening the enormous hog-crop of the States. It has been used for distilling, and for making starch; but recently a profitable employment has been found by converting it into glucose or starch sugar. When we consider that the maize crop of North America exceeded, in 1880, 1,700 million bushels, any new uses for this abundant cereal become important.

In the States of Iowa, Illinois, and Nebraska, there are often thousands, if not millions, of bushels of Indian corn in the ear, that can neither be sold nor fed to stock, and which have to be used as fuel, for want of means of transport to a ready market, for it takes five bushels of corn to pay for sending one bushel to where it can be used.

Mr. Pakenham, the British Secretary of Legation, in his official report for 1873, stated that—

"Between the consumption and exports there is often a surplus of 664 million bushels. Some of this is doubtless utilised, but inquiry from season to season, only elicits the reply that, when not burned, it lies over, deteriorating, and is applied to some inferior purpose, or used for manure."

It would be difficult to define the limits to which the indirect consumption of Indian corn extends. Every pound of American pork eaten, the laundry and food starches used, the large production of alcohol (that of whisky in the States is 67 million gallons), the varnishes used by the cabinet-maker, the perfumery of the toilet table, the different kinds of illuminating fluids, all indicate the universality of the employment of maize.

It was in 1867 that the new use was found for maize, by converting it into glucose. The report of the New York Chamber of Commerce states that the production of this sugar is now not less than 1,000 tons a day for the whole country. A bushel of corn is said to yield thirty pounds of grape sugar, or three gallons of the syrup; and while the sugar costs less than 2d. per pound to make, it is sold at 3½d. and 4d.; the syrup being quite as valuable.

In the States, this class of sugar is used most extensively for mixing with cane sugar and cane molasses; while reducing the sweetening power, it produces a whiter and pleasanter appearance in the sugar. Glucose is largely imported into this country, being chiefly used by the brewers, but more recently for confectionery and preserving purposes. Our imports last year of solid and liquid glucose (chiefly from Germany) were nearly 400,000 cwt., valued at £367,000.

In America, they are also endeavouring to utilise the immense quantities of pulp remaining from the corn after the extraction of the starch. This pulp, which is at present a waste product, consists wholly of cellulose or woody fibre, and would, it is considered, be an excellent material for making the commoner grades of paper, suitable for wrapping and newspaper purposes.

Potash is a valuable product obtained from the destruction of wood. Canada used to supply us with large quantities, but her exports have fallen off by one-third. We only received, in 1881, 60,000 cwt. of potash from all quarters; 16,000 tons used to be made, annually, in the United States, but there is not, now, such an extensive destruction of forests. Throughout Australia, although thousands of tons of timber are burnt annually, the ashes are never lixiviated for the purpose of obtaining potash.

The present sources of the supply of potash are rapidly failing; every year the area of the supply becomes smaller, and the product, in consequence of this and the increased demand, becomes more and more expensive.

The cobs of Indian corn, which are now considered of little or no value, may yet share the same fate as many substances which though formerly considered worthless, have become new mines of wealth, through the aid of chemistry.

The average yield of 1,000 parts of cobs is 7·62 parts of carbonate of potash, or nearly twice as much as the best specimens of wood, and it is a material which can fill its full measure of usefulness for other purposes, before it comes into the hands of the manufacturer of potash. At the shipping ports, large shelling mills are established, capable of running through 500 bushels of corn an hour. Here, then, are the places where a supply of cobs may be procured.

The corn crop of North America varies; but, taking the yield of 1871—1,100 million bushels, at 14 lbs. of cobs to the bushel—this would yield 7,700,000 tons of cobs, containing an average of three-quarters per cent. of pure carbonate of potash. The enormous quantity of 115½ million pounds of that useful article might thus be thrown into commerce. In some districts, these corn cobs are extensively used as fire-lighters, being dipped into a composition of resin and tar, and then dried.

It is only some twenty years now since glycerine, a byé-product in the manufacture of soap and candles, has been produced on a commercial scale, but the quantity now made represents an annual value of nearly a quarter of a million sterling. Glycerine has thus attained to a position of considerable technical importance. The introduction of the stearine candle industry, and the efforts to utilise the heretofore waste products of the soap manufacture, demonstrated its existence in considerable quantity. The important uses to which this substance is now applied are so numerous, that it would be difficult to enumerate them. There are no available statistics to estimate the total magnitude of the glycerine industry of the world, but its extent may be imagined from the fact that, in the United States alone, there is annually produced not less than two million pounds, and in Europe, as is said, about 520,000 cwts.

In Europe, as much use has not been made of seaweed as in China and Japan, where it forms a very large article of consumption for food. In China, it is imported both from Japan and Asiatic Russia, to the extent of more than 25,000 tons a-year. It is received in two forms:—1st quality, cut, and some known as agar agar; and 2nd quality, long. This seaweed is principally consumed by the lower classes of Chinese as a condiment or flavouring, with their rice or other food.

Another product into which seaweed is converted is gelose, a sort of vegetable isin-glass. Viewed from whatever direction, the more general utilisation of seaweed is a most important matter. In some of the northern countries of Europe, cattle are fed on it. Formerly iodine, was only obtained in any quantity from the kelp of seaweed, but it now appears likely that it can be produced in Peru at a comparatively small cost, being a bye-product extracted during the process of manufacturing nitrate of soda; whilst the necessary arrangements for the manufacture of iodine from kelp are very costly, and the works and machinery used require a large sum of money. It is possible that 5,000 or 6,000 cwt. of iodine might be manufactured in Peru at a low cost, but the war with Chili interfered materially with the production. With the exception of the manufacture of kelp, the principal use of seaweed is for manuring land. Under the name of carrageen, or Irish moss, some is used for food. In France, a gelatine or gum is prepared from seaweed, which is variously useful in the arts, as in finishing cotton fabrics, making artificial leather, &c. When chemically prepared and pressed, it was, at one time, used extensively for the manufacture of a substitute for horn, called laminite, but this has been dropped. It has occasionally been made into paper.

There is an application of waste substances of vegetable origin that is largely carried on, which certainly does not merit

approval, being, for the most part, prosecuted for the purposes of deception and fraudulent gain, and this is in substitutes for, or additions to, coffee. Figs, date-stones, lupines, malt, chicory, &c., are largely sold, besides the seeds of a stinking weed (*Cassia occidentalis*) which, when roasted, according to French authorities, is equal to coffee. Whilst the production of coffee is fully equal to the demand, and the price is moderate, I cannot see the necessity for these various substitutes. The more legitimate use of date stones is that to which they are put by the Arabs. They are soaked in water for two or three days, and when somewhat softened, used to feed their camels, cows, and sheep. There are shops in Medina where they sell only date-stones, and the poor often occupy themselves in collecting the date-stones thrown about the streets by those who eat dates.

Ineffectual attempts have been made, from time to time, to utilise the coffee leaf for a dietetic beverage, but the coffee leaf disease and the injury to the trees have effectually checked this. The subject was much discussed a few years ago in the *Journal*. So on the coffee plantations in Brazil and India, endeavours have been made to distil a spirit from the pulp which surrounds the coffee seed. Coffee grounds are, I believe, extensively collected in France, and revivified and flavoured for usage again; but latterly the agriculturists of France have sought to employ them (M. Payen asserting their great value) for manure. As the consumption of coffee in France is stated to be about 50,000 tons, it is asserted that large quantities of this *marc* might be obtained from the hospitals, barracks, coffee-houses, &c.

Cocoa is not so largely consumed in this country as on the Continent. But the cocoa shells or husks which are separated from the nibs after sifting, are imported here to the extent often of 500 tons annually, paying a duty of 2s. a cwt., against 9s. 4d. a cwt., charged on cocoa and chocolate. These shells or husks form about 12 per cent. of the weight of the beans. In the manufacture of the finer chocolates this is always separated, and hence accumulates in large quantities in France and Spain. In the cheaper kinds of chocolate and cocoa, these husks are ground with the nibs, and some other cheap farinaceous substance is added. The black appearance of such chocolate is unmistakeable; it will always be found gritty and rough, and, of course, difficult of digestion. The husks are no better than saw dust, and may cause irritation by the minute spiculae left after grinding. (*Journal of the Society of Arts, December 1882.*)

On Wheat Mildew. By WILLIAM CARRUTHERS, F.R.S., Consulting Botanist to the Royal Agricultural Society.

THE minute fungi which live on other plants and produce blights or diseases, have received special attention in recent years, because of the serious losses which they bring with them, and because of the remarkable facts in the economy of vegetable life which their study has disclosed.

The hop, the vine, the potato, and the different cereal crops are equally liable to great injury, and sometimes to destruction, from the attacks of these parasitic plants. And none is more wide-spreading in its attack, and more serious in its action, than the mildew which attacks the wheat-crop in summer or autumn.

The desire to discover some means of preventing or alleviating the malady caused by mildew, has led to the frequent careful study of this plant. In the second volume of this Journal (pp. 11. and 220), Professor Henslow, in a paper on the diseases of wheat, gave a careful description of the mildew, and reasons for believing that rust and mildew were produced by the same fungus. He also investigated the prevalent notion that the barberry was in some way connected with the mildew, and recommended that experiments should be instituted with the view of testing the matter. He was not himself prepared to accept the opinion, though he records a case which he found it hard by any other explanation to understand. A farmer in Oxfordshire had a field which, when sown with wheat, was generally infected at one portion with mildew. This part was in the immediate neighbourhood of an old hedge, in which there were several barberry bushes. The blight did not extend farther than twenty yards from the hedge, and it was most abundant in the immediate neighbourhood of each of the somewhat widely-separated bushes. The farmer had all the barberry cut out of the hedge. He took one of the largest bushes and placed it in the middle of the field. Before reaping he found the straw, for some yards round the bush, injured by mildew though not to the same extent as on the side of the field nigh to the hedge.

A later volume of the Journal contains an able and lucid exposition of the parasitic fungi of the British farm, which had been delivered as a popular lecture by the Rev. Edwin Sidney, and among them is included the mildew fungus.

Until the investigations of Tulasne and De Bary, nothing was added to the knowledge of the mildew, beyond what was contained in these papers.

The belief held by Henslow, that rust and mildew were produced by the same fungus, was demonstrated to be the case by Tulasne, who proved that the rust was an earlier stage in the

life-history of the plant which afterwards produced the mildew.

The relation between the barberry and the mildew was established still later by De Bary, who discovered that the cluster-cup or *Ecidium* on the leaf of the barberry was a still earlier state of the mildew than the rust.

That a plant might spend some stages of its life in conditions and under a form different from its perfect state, was in harmony with obvious facts in the animal kingdom. The development of the grub living in the earth or swimming in the water, into a fly or beetle inhabiting the air, made one familiar with great changes in the life-history of an organic being. The perfect state was easily determined, because only in that state had the animal the power of producing eggs, and so providing for the continuance of its kind. But in these parasitic fungi, each stage ended in the production of spores, that is, of bodies equivalent in function to the seeds of flowering plants or the eggs of animals, and capable of developing fresh individuals.

The structure of the fungus in the different stages of its existence, as the *Ecidium* on the barberry, and the rust or mildew on the wheat, was so very different, that botanists could not entertain the notion that any organic relation existed between them, and those most intimately acquainted with these parasitic plants, were most decided in their views as to the absurdity of entertaining such a notion. Especially did it appear improbable that the plant grown from a spore should have no resemblance to the parent producing the spore, but that instead it should belong to a group which the scientific student had widely separated from the parent. Within the last ten years our first authority in England wrote:

"There has been a very unjust charge brought against *Ecidium berberidis* a beautiful species which attacks the leaves, flowers, and young fruit of the barberry as if it were the cause of mildew in wheat. Great, however, as are the changes which fungi undergo occasionally in passing from one condition to another, there is not the slightest reason for imagining that the *Ecidium* is a transitorial state of wheat-mildew. It has its own mode of propagation and passes through nearly the same phases of vegetation as the mildew, without affording a suspicion that it is not a perfect plant. The whole story has no doubt arisen from the *Ecidium* being common on the barberry in hedges surrounding wheat-fields; and there is reason to believe the report is true, that wheat has been especially mildewed in the neighbourhood of the *Ecidium*. The peculiar situation may, however, be equally favourable to either parasite; and it is to be observed that mildew is peculiarly prevalent in districts where the barberry is unknown except as a garden plant."

The careful investigations and experiments of De Bary, corroborated by the subsequent discovery by other botanists of similar phenomena in the life-history of other fungi than mildew of wheat, have, however, determined beyond all question that the *Ecidium* of the barberry, the rust and the mildew of wheat, are

only stages in the life of the same plant, though each stage presents the phenomena we have been accustomed to consider characteristic of a perfect plant by producing innumerable spores or seeds capable of giving rise to new individuals. De Bary has indeed produced each stage of the plant from the spores produced by the previous stage.

Let us now trace the history of the fungus through its different forms of life.

The first stage in its life, after the rest of the winter, is that which it passes on the barberry. In the spring the leaves of this plant may sometimes be found with swollen yellowish spots, which in a short time burst through the skin, and from little bordered cups filled with a reddish powder. Under this form the plant is known as *Aecidium berberidis*. The genus *Aecidium* was, till recently, believed to contain a clearly limited and natural group of species, of which nearly forty were found in Britain on the leaves or stems of the barberry; gooseberry, buttercup, anemone, spurge, nettle, &c.

That on the barberry occurs chiefly on the leaves, but sometimes attacks the leaf-stalk and the fruit. It may be detected in May or June as a bright red spot on the under-side of the leaf, which, when carefully examined, is found to be a little cup full of free, round, and very minute bodies. A still more minute examination of the leaf will show that the fungus has another form of fructification on the upper surface of the leaf, where one may detect some scarcely perceptible pustules, through the central pore of which protrude a small bunch of minute hairs. In section and under the microscope these pustules are seen to be the openings of small flask-shaped bodies filled with the delicate needle-like hairs which protrude themselves through the opening. Towards the base of the flask may be detected numerous very minute round bodies, the function of which has not yet been clearly ascertained. The larger cups opening on the lower surface of the leaf are found to be equally well defined, and to be enclosed in a distinct covering. At first appearing as little spores, they increase in size until they burst through the skin, and the apex breaks in a more or less regular manner, forming a margin to the cup, which is filled with minute round bodies of a reddish colour. These are the spores from which the next stage of the plant is developed.

Both forms of fructification grow on very delicate fungal threads, called mycelium, which penetrate the leaf in every direction, and withdraw from it the food required for the life and growth of the parasite.

The quantity of spores produced in the cups on a single barberry leaf is enormous. It is impossible to realise the myriads of fungal spores which are floating in the atmosphere during

the greater part of the year, ready, whenever the fitting physical conditions are present, to germinate. No place is free from their presence. They are so minute that we see them only as motes dancing in the sunbeam. But though so minute, they are mighty agents for good or for evil, because of their extraordinary quantity.

The spores of fungi are limited, to some extent, in their operations by the fact that each spore can germinate only on the species of plant that is proper to it. If the seed of a flowering plant be supplied with suitable heat, moisture and air, it will germinate in any soil, and maintain a vigorous life or otherwise, in accordance with the character of the soil. But happily the spores of these fungi must not only have the necessary physical conditions required by the seed, but they will fail in establishing themselves unless they further find these conditions associated with that particular species of plant with which their life-history is associated.. Were it not so, the spores produced in a single season would be more than sufficient to clothe every inch of the surface of the earth with a dense mould.

The red spores of the barberry fungus will produce a mycelium only when they germinate on the leaf or stem of wheat, or of some other grass. And they can germinate there only when they can obtain a sufficient supply of moisture.

It is a very general notion that mildew and other blights are "in the air," or are produced by fogs or mists. To some extent these notions are true. The farmer has observed the atmospheric conditions favourable to the growth of the spores, and without being aware how they quickened into life the everywhere present spores, they give the physical conditions the credit of being the efficient producers of the blight. But just as dry grain remains for any length of time in the barn without germinating, so the spores of the potato-fungus rest on the potato, or those of the barberry-fungus on the wheat without germination, if there be no free moisture accessible to them. A slight reduction of temperature, when the warm air of summer or autumn is saturated with moisture after rain liberates some of the aqueous vapour which had formed an invisible ingredient of the atmosphere, and a mist is produced. This mist supplies the spore with the moisture it needs, and germination begins; a small tube is pushed out, and, finding its way to one of the minute openings or stomates of the leaf, it passes through into the tissues, where, finding suitable food, it rapidly grows. In a week or ten days one can detect the presence of the fungus in the wheat by linear reddish swellings on the leaf and stem. When ripe, the skin bursts, and innumerable oval red spores are exposed and dispersed.

When the suitable conditions are present, these spores germi-

nate on wheat or on other grasses, the growing tubes pass through the stomates produce mycelium in the cellular tissues of the leaf, and in a week, more or less, a new crop of spores bursts the skin of the plant and is scattered in the air. Several generations of this form of the fungus may be produced in the course of a few weeks. In the older patches, and from the same mycelium, another kind of fruit is produced, at first among the red spores of the rust, and then entirely by itself when the production of the rust-spores ceases. These are the spores of the mildew. They are oblong, and taper towards each end, and are composed of two cells, the division being across the middle of the spore.

As in the rust, the delicate threads or mycelium of the mildew penetrate the cellular tissue of the leaf or stem in every direction. The spores are produced under the skin. They form long narrow swellings of a brownish colour. When the swellings burst the skin, a mass of dark spores fills the opening. If the disease is very bad, the plant is so completely covered with the dark spores that it has the appearance of having been scorched.

The active life of the fungus closes with the production of the mildew-spores. These spores do not germinate and propagate the mildew in other wheat plants. This is done only by the spores of the rust. The mildew spores remain on the leaves and straw throughout the winter, and show no signs of life till the spring, when, under favourable conditions, they begin to germinate. Each of the two cells of which the spore is composed sends out a short filament, that terminates in three or four branches. The tips of these branches swell, and another kind of spore is produced, after which the filament dies. These minute and delicate spores develop a mycelium only when they germinate on the leaf of the barberry. The germinating filament does not seek admission to the leaf through a stomate, but it has the power, like the spores of the fungus which causes the potato disease of penetrating the skin where it germinates and passing directly into the tissues of the leaf. There it rapidly grows, and in a short time produces the two kinds of fructification which have been already described.

The injury done to the wheat by the rust and mildew arises from the fungus appropriating to its own use the elaborate juices of the wheat. Fungi are plants without the green colouring matter, or chlorophyl, which exists in other plants, and they are consequently unable to separate the carbon from the carbonic acid gas of the air, that is, to manufacture plant-food from the raw materials on which plants live. They therefore depend on the already prepared food of the plants, on which they are parasitic. The fungus in its rust-stage takes possession of the growing plant, and weakens it so far as it appropriates the

material which was intended to build up the growing wheat. But as the wheat at the time of the attack is very active in assimilating food, the rust rarely injures to any serious extent the crop, unless in an exceptionally wet season, when the abundance of moisture secures the germination of successive crops of spores. A few bright sunny days arrest the progress of the fungus, and vigorous plants overcome the attack without any real injury.

When, however, the mildew appears at a later stage in the life of the wheat, the conditions are entirely changed. The period of active assimilation of food is past. The plant has laid up stores of food in various parts of its structure, and the processes of flowering and fruiting, which use up these stores are proceeding. The altered starch is being conveyed from the cells, where it was temporarily located to its final destination in the seed. The fungus arrests it in its progress, and converts it to its own use. The wheat is not able to cope with the parasite as in the earlier stage of its life when the fungus was present as rust. It cannot start again the process of assimilating food, and consequently the seed is more or less imperfectly filled, in proportion to the time at which the fungus attacks the plant, and the extent of the attack.

The story of the fungus suggests important considerations to the farmer. First, it is certain that the brown spores of the mildew which remain attached to the straw after harvest, are the means by which the fungus retains its vitality through the winter. Converting the straw into manure does not destroy the spores, but rather provides in the spring the conditions fitted for their germination. It may be recommending a serious destruction of property to suggest the burning of mildewed straw, but fire is the only agent that will effectually destroy the spores.

Then it should be noted that even the brown winter spore produced by the mildew will be harmless, unless the spores formed at the tips of its branches in the spring rest on the leaf of the barberry. The farmer should not permit the barberry to have a place in his hedges, or in plantations on his farm.

Further, that while rust may in itself be injurious to the crop, it is more dangerous as the earlier stage of the mildew, and as the producer of crop after crop of spores which produce mildew. The only check to the rust is a bright sun and a warm dry atmosphere.

From the history of the fungus, it is manifest that at no stage is it under our control; and though we can take steps which may prevent at different stages the unnecessary increase of the spores, we must be baffled in any attempt to prevent the appearance of the disease, whether in the rust or the mildew stage.

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	Mohender Pertab Sing, Maharajah, Bahadoor, of Orcha, Telri	... 1876
	Muhammad Hussin Khan Bahadoor, Nawab-zada of Baonie	... 1877
40	Munsier Ali, H. H., The Nawab Nazim of Bengal	... 1874
	Palmer, T. A. G., Esq., Chudderghat, Hyderabad	... 1861
	Rajah of Nursinggurh, H. H. the Bhopal	... 1882
	Richards,* J., Esq., Merchant	... 1834
	Roodurpurshaud Chowdry, Nanpore, Tirhoot	... 1867
45	Roordur Purtab Sing, Rajah Bahadoor, Dewan of Punna	... 1868
	Sajjan Sing Bahadoor, H. H. Maharanee of Mewar	... 1882
	Suttyanundo Ghosal, Rajah Bahadoor, Bhookeylas, Vice-President	... 1869
	Wigram,* Percy, Esq., c. s.	... 1871

ORDINARY MEMBERS.

	A.	<i>Admitted.</i>
	ABBOTT, Horace, Esq., Rajapore, <i>viā</i> Koosteah	... 1858
50	Abbott, H. E., Esq., Manager, Jaintpore Factory, Tirhoot	... 1874
	Abdool Gunny, Kajee, c. s. i. Nawab, Zemindar, Dacca	... 1860
	Adkin, H. A., Esq., Solicitor, Calcutta	... 1878
	Ady, Charles, Esq., Merchant, Moulmein	... 1864

A.—(Continued.)

Admitted.

Aitchison, W., Esq., Manager, Dooloo Tea Garden, Cachar	...	...	...	1869
55 Ambler, Chas. T., Esq., Merchant, Monghyr	...	...	...	1883
Amrita Narayan Acharjee Chowdry, Baboo, Mukta- gacha, Mymensing	...	...	...	1881
Anderson, J. A., Esq., Merchant, Calcutta	...	...	...	1881
Anderson, T. S., Esq., Merchant, Calcutta	...	...	...	1881
Armstrong,* Joseph Samuel, Esq., c. s.	...	...	...	1865
60 Assistant Manager, Ting Ling Tea Co., Darjeeling Assistant Manager, Singbulli and Nurmah Tea Co., Limited, Darjeeling	...	...	...	1875
Aubinash Chunder, Banerjee, Baboo, Zemindar, Bally	...	...	...	1881
Azimuddin Khan, Genl., Rampore Estate, <i>via</i> Mo- radabad	...	...	...	1883

B.

BANON, Capt. A., 39th N. I., Morar	...	...	1877
65 Baring, Major the Hon'ble E., R. A., c. s. i.	...	...	1881
• Barker, Dr. R. A., Civil Surgeon, Nya-Doomka	...	...	1870
Barlow, G. N., Esq., Civil Service, Bhagulpore	...	...	1864
Baron,* Major W., Depy. Supdt., Revenue Survey, 4th or Moradabad District, Nynee Tal	...	...	1871
Barry, J. H., Esq., Merchant, Calcutta	...	...	1881
70 Barry, Sam., Esq., Kellyden, Assam	...	...	1882
Barstow, H. C., Esq., Civil Service, Cawnpore	...	...	1868
Bartholomew; Major R., Depy. Comr., Jhung	...	...	1882
Bauermeister, Augustus, Esq., Merchant, Saigon, <i>via</i> Singapore	...	...	1881
Beadon, R. B., Esq., Hopjaun Porbot, Jaipore, Luckimpore, Assam	...	...	1879
75 Beadon, W. à Court, Esq., Supdt., Central Jail, Midnapore	...	...	1880
Beezly, J. L., Esq., Seleng Tea Co., Jorchaut, Assam	...	...	1879
Behari Lall Pyne, Baboo, Calcutta	...	...	1876
Bejoy Kissen Mookerjee, Baboo, Ooterparah	...	...	1880
Bell, H., Esq., Gowhatta	...	...	1882
80 Bellow, F. D., Esq., Senr., Master Pilot, Calcutta	...	...	1883
Berkeley, Dr., Xth Royal Hussars, Lucknow	...	...	1882
Beveridge,* H., Esq., c. s.	...	...	1865
Bholanath Dhur, Baboo, Merchant, Calcutta	...	...	1880
Bhugwan Chunder Bose, Baboo, Howrah	...	...	1875
85 Bhupendro Bahadoor Sing, Rajah of Kuntil, Mirza- pore	...	...	1881
Bigge, E., Esq., Merchant, Calcutta	...	...	1883
Binning, J., Esq., Calcutta	...	...	1877

B.—(Continued.)

	<i>Admitted.</i>
Blechynden, R., Esq., Merchant, Calcutta	... 1858
Blechynden,* A. H., Esq., Secretary, Agri-Horti. Society of India	... 1851
90 Blechynden, F. W., Esq., Moorla Factory, Chum- parun	... 1883
Blechynden, R., Esq., Jr., Depy. Secy., A. & H., Socy., 'Calcutta'	... 1883
Bleeck, W., Esq., Imperial German Consul, Calcutta	1883
Boerresen, The Rev. H. P., Ebenezer Station, <i>via</i> Rampore Haut	... 1879
Bose, A. M., Barrister-at-Law, Calcutta	... 1883
95 Boxwell, J., Esq., c. s., Durbhungah	... 1874
Bradley, W. Mackenzie, Esq., Merchant, Calcutta	1882
Brae, T., Esq., Munjapara, Pubna	... 1854
Brett, A. C., Esq., c. s., Mozufferpore	... 1879
Bridge, Alfred, Esq., Calcutta	... 1881
100 Bridgman, J. H., Esq., Goruckpore	... 1868
Brock,* C., Esq.	... 1881
Brodhurst, M., Esq., Civil Service, Allahabad	... 1859
Brown, Forbes Scott, Esq., Merchant, Penang	... 1840
Brown,* H. F., Esq., Merchant	... 1875
105 Brown, T. Allen, Esq., Deputy Magistrate, Agra	... 1881
Browne, Lord Ulick, Civil Service, Rajshaye	... 1870
Bryce, J., Esq., Serajgunge	... 1882
Bryce, J. R. S., Esq., Sagrampore Factory, Bhagul- pore	... 1882
Buck, E. C., Esq., c. s., Calcutta	... 1876
110 Buckingham, J., Esq., Manager, Amjoori Tea Estate, Assam	... 1879

C.

CAMPBELL, Lt.-Col. A. E., Depy. Commissioner, Seeb- saugor, Assam	... 1879
Campbell, W., Esq. Kurhurrie Factory, Tirhoot	... 1883
Campbell, A., Esq., Asst.-Conservator of Forests, Go- ruckpore	... 1883
Cantonment Magistrate, Lucknow	... 1876
115 Carberry, R. J., Esq., Calcutta	... 1883
Carew, B. H., Esq., Damdim, Julpigoree	... 1879
Carshore, Walter B., Urniah Factory, Shapore, Oonde, <i>via</i> Bajitpore, T. S. Railway	... 1875
Castle, C. T., Esq., Dist. Supdt., Police, Budaon	... 1880
Chapman, A. W., Esq., Broker, Calcutta	... 1877
120 Chatterjee, S. P., Baboo, Victoria Nursery, Calcutta	1882
Chief of Kagul, Kagul, near Kolapore	... 1879

C.—(Continued.)

	<i>Admitted.</i>
Chrestien, E., Esq., Bugha, Chumparun	1875
Chunder Caunt Mookerjee, Baboo, Calcutta	1866
Cogswell, W. H., Esq., Calcutta, <i>President</i>	1866
125 Cole, Rev. J., Supdt., Lawrence Asylum, Sanawur, near Kussowlie	1865
Collier, F. R. S., Esq., c. s., Serampore	1875
Collins, A. H., Esq., c. s., Rampore Hât, Beerbhoom	1881
Cooke, Robins, Esq., Sylhet	1878
Cooke,† H. R., Esq., Assist. Secy., Foreign Dept., Calcutta	1882
130 Coombe,* Dr. F. S.	1877
Cornell,* W., Esq., Civil Service	1861
Conroy,* G. H. W., Esq.	1879
Corbyn, Major E. C., Dy. Commr., Shahpore, Punjab	1883
Creton, W. E., Esq., Merchant, Calcutta	1875
135 Cresswell,* W. S., Esq., Merchant	1874
Croft, J. R., Esq., Merchant, Calcutta...	1883
Crowdy, L. J., Esq., Munjowl Factory, Beguserai, Monghyr	1875
Crankshank, D., Esq., Merchant, Calcutta	1881
Currie,* G. M., Esq., Civil Service	1868

D.

140 DALGAIKNS,* Dr. A. E., 7th Regt., M. N. I.	1879
Dalglesh, E. W., Esq., Tea Planter, Dulsing Serai, Tirhoot	1873
Dalrymple,* Major W., ...	1881
Daly, R. M., Esq., H. M., Bengal Marine, Calcutta...	1880
Darwood, J. M., Esq., Rangoon	1878
145 Davis, C. T., Esq., Solicitor, Calcutta...	1874
Dawson, F. A., Esq., Dist. Supdt. Police, Bancoorah	1883
Dear, Herschel, Esq., Monghyr	1860
Deas, C., Esq., Motiharee ...	1874
Delius, Edward, Esq., Calcutta	1881
150 Denham,* C. H., Esq., c. e., Howrah ...	1874
Deputy Commissioner of Sumbulpore...	1866
Deputy Commissioner of Ellichpore ...	1869
Deputy Commissioner of Woon ...	1869
Deputy Commissioner of Bassim, West Berar	1871
155 Deputy Commissioner of Akola, Berar	1875
Deveria, J., Esq., Dhadkha, Maunbhoom	1880
Dhoje Nursingha Bahadoor, Rana, Lieut.-Genl., Kat- mandoo, Nepal	1881
Dignam, S., Esq., Solicitor, Calcutta ...	1876

D.—(Continued.)

		<i>Admitted.</i>
	District Engineer, JESSORE	1881
160	Donaldson, P., Esq., Supdt. of Jail, Buxar	1882
	Dowuing, C. Y., Esq., Zemindar, Purneah	1881
	Duke, C., Esq., Depy. Commr., Tavoy, B. Burmah	1881
	Dwarka Nath Dutt, Baboo, Calcutta	1874

E.

	EDEN,* Hon. Sir A., K. C. S. I., C. I. E. ...	1873
165	Elsin, S. R., Esq., Senior Master Pilot, Calcutta	1883

F.

	FARQUHARSON, F., Esq., Nunmattec Tea Estate, Gow-hatty	1883
	Ferris, Dr. G. R., Calcutta	1883
	Finch, Herbert, Esq., Mewna Indigo Concern, Kuttra P. O., near Shahjehanpore	1882
	Francis, T. M., Esq., Durbhangah	1883
170	Fisher,* J. H., Esq., c. s. ...	1871
	Flemington, J., Esq., Merchant	1882
	Franklyn, Captain, W. H. M., Tonghoo	1881
	Fraser, Ronald, Mohurgong Factory, Silligoree	1875
	Freemann,† Major T. A., 2nd Batt., East Surrey Regt., Dinapore	1881
175	Freeman, H. J. F., Esq., Tea Planter, Rungneet Tea Estate, Darjeeling	1882

G.

	GALE, M. H. L., Esq., Pundowl Concern, Durbhangah	1873
	Galios, A., Esq., Berhampore	1881
	Gannon, J., Esq., Lucknow	1879
	Garbett, Major C. H., Assist. Commr., Chaibassa, Singbroom	1868
180	Gardner, D. M., Esq., Civil Service, Benares	1872
	Gibbon, T. M., The Hon'ble, c. i. e., Betteah	1874
	Gibbon, W. F., Esq., Senr., Doolah Factory, Goruckpore	1870
	Gilman, J. H. S., Sonapore Tea Factory, Gowhatta	1874
	Gocool Nath Chatterjee, Baboo, Calcutta	1874
185	Goethals, S., His Grace The Most Revd. Dr., Arch-bishop of Hieropolis, Calcutta	1881
	Golam Mohee-oed-deen, Shaik, Meerut	1882
	Gordon, D. T., Esq., Surdah	1859
	Gordon, Capt., A. Evans, Depy., Commr. Cooch Behar	1879

G.—(Continued.)

Admitted.

190	Gowan, S., Esq., Serajgunge	...	1881
	Grant, G. H., Esq., Indigo Planter, Bhangulpore	...	1859
	Grant, J. P., Esq., Civil Service, Hooghly	...	1882
	Grant, W., St. Clair, Esq., Latipore Concern, Bhau-		
	gulpore	...	1879
	Gray,* Dr. E.	...	1875
	Grija Prosunno Mookerjee, Baboo, Zemindar, Gober-		
	danga	...	1878
195	Greenhill, T., Esq., Calcutta	...	1877
	Grierson, G. A., Esq., c. s.; Bankipore	...	1877
	Grimwood, F. St. C., Esq., c. s., North Luckimpore,		
	Assam	...	1878

H:

	HAMILTON,* T. F., Esq., Merchant	...	1881
	Hara Chundra Roy Chowdry, Baboo, Zemindar,		
	Shereporo, Mymensing	...	1881
200	Harman, A. L., Esq., Jatepore Factory, Chupra	...	1876
	Harrison, Augustus S., Esq., Principal of the Muir		
	College, Allahabad	...	1873
	Hawkins, Lieut.-Col. E. L., R. A., Meerut	...	1871
	Hawkins,* R. W. L., Esq., Asst. Engineer	...	1877
	Hay, John, Esq., Merchant, Calcutta	...	1876
205	Head Gardener of the Ram Nawas, Jeypore	...	1876
	Helps, W., Esq., Manager, Fallowdhi Tea Co., Dar-		
	jeeling	...	1875
	Heriot,* W. Maitland, Esq., Merchant	...	1882
	Hill, Dr. J. H. G., Turcooleah Factory, Motteharea,		
	Chumparun	...	1865
	Hill,* R. H., Esq.	...	1865
210	Hill,* T. C., Esq.	...	1881
	Hindmarsh, Thos., Esq., Kanchraparah, E. B. Ry.	...	1881
	Hobson,* E. A., Esq., Merchant	...	1875
	Hudson, C., Esq., Merchant, Calcutta	...	1881
	Hunter, J. K., Esq., Koopili Tea Estate, Assam	...	1870
215	Hurrender Kishore Singh, Bahadoor, Maharaj Coo-		
	mar, Betteah	...	1879

I.

	INGLIS,† A. B., Esq., Merchant, Calcutta	...	1873
	Innes, W., Esq., Traffic Supdt., E. B. Ry., Sealdah	...	1881
	Irving, M. O. Bell, Esq., Merchant, Calcutta	...	1882
	Ishore Pershad Narain Singh, Bahadoor, Maharanjah		
	of Benares	...	1854
220	Iswar Prosad Gorgo, Rajah, Maisadal	...	1883

J.

		<i>Admitted.</i>
	JACKSON,* W. G., Esq., c. s.	1876
	Jaykissen Rai, Hony. Magistrate, Patna	1880
	Jefferson, W. E. S., Esq., Calcutta	1875
	Jennings, N. E., Esq., Tarapore, Kotechandpore, <i>via</i> Krishnagunge	1880
225	Joakim, H. J., Esq., Merchant, Calenitta	1883
	Johnson,* H. Luttman, Esq., Civil Service	1873
	Joykissen Mookerjee, Baboo, Zemindar, Ooterpara	1852
	Juggut Singh Koer, Tajpore, <i>via</i> Bijnour	1874

K.

	KALLONAS, J. J., Esq., Indigo Planter, Mymensing	1881
230	Keith, G. E., Esq., Merchant, Calcutta	1880
	Kemp, Geo. Lucas, Esq., F. R. G. s., Calcutta	1871
	Ker Andrew, Esq., Merchant, Calcutta	1880
	Kernot, Dr. C. N., Calcutta	1881
	Kerswill,* T. H., Esq.	1881
235	Kidd, Dr. H. A., Civil Surgeon, Mundla	1871
	Kincaid, Lieut.-Col. W., Pol. Agent, Bhopal, Sehore	1867
	King, Dr. Geo., Supdt., Royal Botanical Garden, Calcutta	1872
	King, H. M., Esq., Phoolbarrie Tea Co. Ltd., Pil- lan's Hat, P. O., Siligori	1881
	Kisch,* H. M., Esq., c. s.	1876
240	Knyvett, Liout.-Col. W. L. N., Bhagulpore,	1864
	Koek, Edwin, Esq., Advocate, Supreme Court, Sin- gapore	1880

L.

	LALIT MOHUN RAE, Baboo, Zemindar, Chakdigi	1881
	Landale,* D. G., Esq., Merchant	1880
	Larminie, J. S. C., Esq., Comillah	1881
245	Larmini, W. R., Esq., Civil Service, Cuttack	1862
	Larmour, F. A., Esq., Calcutta	1874
	Lawder, E. J., Esq., Private Secy. to Nawab Vikar- ul-Umra, Hyderabad, Deccan	1883
	Leadbeater, J., Esq., Ranikhet	1883
	Lees,* Col. W. M., Secretary, Govt. of India, Mili- tary Dept.	1871
250	Leitch, Henry Joseph, Esq., Broker, Calcutta	1872
	Leslie, S. J., Esq., Solicitor, Calcutta	1873
	Liston, Major, J., Deputy Commissioner, Lalitpore	1880
	Lloyd, M., Esq., Indigo Planter, Shapore Oondee, Tirhoot	1863

I.—(Continued.)

Admitted.

Lewis, Major F. R., R. A., Calcutta	...	1883
255 Lutchmeeput Sing, Roy Bahadoor, Banker, Calcutta	...	1864
Luchmessur Sing, Bahadoor, Maharajah, Durbhun-		
gah, Tirhoot	...	1861
Lyall, D. R., Esq., Civil Service, Calcutta	...	1869
Lyall, R. A., Esq., Merchant, Calcutta	...	1875
Lynam,* John, Esq., Supdt., Reserve Police Force	...	1866
260 Lynch, Dr. Sydney, Calcutta	...	1872

M.

MACKENZIE, W. Esq., Itmasnuggur, Somastipore,		
Tirhoot	...	1880
Mackenzie, C. B., Esq., Gajiliduba Tea Estate, Jul-		
pigoree	...	1883
Mackillican, J. Esq., Merchant, Calcutta	...	1865
265 Mackinnon, D., Esq., Merchant, Calcutta	...	1874
Mackinnon, John, Esq., Merchant, Calcutta	...	1875
Mackintosh, A., Esq., Bassopaly <i>via</i> Sewan, Sarun	...	1879
MacLachlan, J. E., Esq., Merchant, Calcutta	...	1861
Macleod, Lieut., R. W., 29th P. N. I., Agra	...	1883
Macpherson, W., Esq., Civil Service, Calcutta	...	1861
270 Madho Lall, Moonshee, Munsiff, Mirzapore	...	1883
Mahabeer Persad Rae, Bahadoor, Baboo, Chuprah...	...	1882
Maharajah of Betteah, Tirhoot	...	1870
Maharajah of Cooch Behar	...	1864
Maharajah of Mourbhunge, <i>via</i> Balasore	...	1883
275 Maharajah (Coomar) of Vizianagram ...	...	1879
Manager, Amluckee Tea Company, Assam	...	1877
Manager, Awali Estate, Awahgurh, Agra District...	...	1879
Manager, Balasun Tea Co., Darjeeling	...	1875
Manager, Bengal Tea Company, Cachar	...	1867
280 Manager, Bishnath Tea Co., Assam	...	1875
Manager, Blackburne Tea Garden, Assam	...	1881
Manager, Boreilli Tea Company, Assam	...	1873
Manager, Brahmapootra Tea Co., Assam	...	1875
Manager, Boromcherra Tea Garden, Cachar	...	1876
285 Manager, Bowreah Cotton Mills, Co. Ltd.	...	1883
Manager, Central Cachar Tea Co.	...	1875
Manager, Central Terai Tea Co., Darjeeling	...	1875
Manager, Chenga Tea Association, Darjeeling	...	1875
Manager, Chumta Tea Association, Darjeeling	...	1875
290 Manager, Chunderpore Tea Garden, Assam	...	1875
Manager, Chundypore Tea Company, Cachar	...	1862
Manager, Cutlee Cherra Garden, Cachar	...	1865

M.—(Continued.)

	<i>Admitted.</i>
Manager, Dahingeapore Factory, Assam	.. 1865
Manager, Darjeeling Tea and Cinchona Association, Darjeeling	1879
295 Manager, Debrooghur Divn., Upper Assam Tea Co., Assam	1881
Manager, Durrung Tea Company, Assam	.. 1877
Manager, Dewkouall Estate, Cuttack	.. 1871
Manager, East India Tea Company, Assam	.. 1865
Manager, East India Tea Company, Cachar	.. 1866
300 Manager, Equitable Coal Company, Ld., Seetaram- pore	1882
Manager, Fort Gloster Jute Manufacturing Com- pany, Limited	1883
Manager, Gellahutting Tea Estate, Assam	.. 1877
Manager, Giel Tea Co., Darjeeling	1875
Manager, Goomrah Factory, Tirhoot	1865
305 Manager, Government Garden, Fyzabad, Oudh	.. 1871
Manager, Government Garden, Gondah, Oudh	.. 1875
Manager, Greenwood Tea Garden, Assam	.. 1875
Manager, Halmara Tea Estate, Assam	.. 1870
Manager, Hoolmarea Tea Co., Assam	.. 1875
310 Manager, Hattibanda Tea Company, Nowgong, Assam	1881
Manager, Julnacherra Tea Garden, Cachar	.. 1875
Manager, Kaleabar Tea Estate, Assam	.. 1876
Manager, Kallacherra Tea Company, Cachar	.. 1862
Manager, Kalline Tea Garden, Cachar	.. 1874
315 Manager, Kamptee Gwallie Tea Estate, Debrooghr	1875
Manager, Kanchunpore Tea Company, Cachar	.. 1862
Manager, Kassomaree Tea Garden, Assam	.. 1875
Manager, Kobira Tea Estate, Mungledye, Assam	.. 1877
Manager, Koeyah Factory, Cachar	1865
320 Manager, Koombar Tea Estate, Cachar	.. 1882
Manager, Koontai Tea Garden, Assam	.. 1869
Manager, Lalla Mookh Tea Garden, Cachar	.. 1875
Manager, Lallacherra Garden, Cachar	.. 1879
Manager, Luckimpore Tea Co., Assam	.. 1875
325 Manager, Luckwah Tea Garden, Assam	.. 1875
Manager, Majagram Tea Co., Cachar	.. 1875
Manager, Majulighur Tea Estate, Assam	.. 1875
Manager, Meleng Tea Estate, Assam	.. 1881
Manager, Monacherra Tea Garden, Cachar	.. 1875
330 Manager, Moran Tea Co., Sebsaugor, Assam	.. 1875
Manager, Margaret Hope Tea Plantation, Darjeeling	1876
Manager, Massempore Tea Garden, Cachar	.. 1875

M.—(Continued.)

	<i>Admitted.</i>
Manager, Mettegurrah Tea Concern, Darjeeling	... 1877
Manager, Mesia Jan Tea Estate, Debrooghur	... 1875
335 Manager, Moonee Tea Estate, Darjeeling	... 1883
Manager, Munguldye Tea Co., Assam ...	... 1875
Manager, Muttuk Tea Co., Assam . . .	... 1878
Manager, Narainpore Garden, Cachar ...	... 1865
Manager, New Golaghat Assam Tea Co., Assam	... 1881
340 Manager, Noakacherra Tea Company, Assam	... 1865
Manager, Nonai Tea Company, Assam ...	... 1882
Manager, Noobaree Tea Estate, Assam	... 1878
Manager, Nuddea Ward's Estate, Krishnaghur	... 1875
Manager, Otter Indigo Concern, Tirhoot	... 1882
345 Manager, Pattareah Tea Co., Sylhet ... .	... 1875
Manager, Phoenix Tea Co., Cachar ...	... 1878
Manager, Piakpara Estate, Piakpara, near Calcutta...	1879
Manager, Punkabaree Tea Co., Punkabaree	... 1878
Manager, Rajmai Tea Estate, Assam ...	... 1881
350 Manager, Rampore Tea Garden, Cachar	... 1880
• Manager, Rangli Rungliot Tea Company, Darjeeling	1883
Manager, Rookenee Tea Garden, Cachar	... 1882
Manager, Roopacherra Tea Garden, Cachar	... 1875
Manager, Rungting Tea Co., Darjeeling	... 1881
355 Manager, Scottish Assam Tea Co., Assam	... 1875
Manager, Silcorie Tea Garden, Cachar...	.. 1875
Manager, Singtoom Tea Garden, Darjeeling	... 1880
Manager, Singbulli and Nurmah Tea Co., Ltd., Darjeeling ... . . . . .	... 1875
Manager, Singell Tea Company, Darjeeling	... 1874
360 Manager, Sissobari Garden, Julpigoree ...	... 1877
Manager, Sonai Tea Co., Cachar ...	... 1877
Manager, Springside Tea Garden, Kurseong	... 1875
Manager, Tarrabarrie Tea Estate, Darjeeling Terai, Silligoree ... . . . . .	... 1882
Manager, Tarrapore Tea Co., Burtoll Div., Cachar ...	1880
365 Manager, Tarrapore Tea Co., Dewan Divn., Cachar	1882
Manager, Tarrapore Tea Co., Labac Divn., Cachar ...	1882
Manager, Tarrapore Tea Co., Lallong Div., Cachar	1865
Manager, Tarrapore Tea Co., Tarrapore Div., Cachar	1871
Manager, Tarrapore Tea Co., Thaelu Divn., Cachar	1882
370 Manager, Teendarea Tea Company, Darjeeling ...	1874
Manager, Teesta Valley Tea Association, Darjeeling	1875
Manager, Terriannah Tea Plantation, Darjeeling ...	1876
Manager, Tukvar Tea Co., Darjeeling ...	... 1878
Manager, Woodlands, Cachar ...	... 1882
375 Manisty, G. E., Esq., c. s., Mymensing ...	... 1883

M.—(Continued.)

		<i>Admitted.</i>
	Manook, Dr. S. J., Civil Surgeon, Chyebassa	1866
	Martin, John, Esq., Merchant, Calentta	1874
	Masters, C. C., Esq., Barrister-at-Law, Bankipore	1878
	Maseyk, J. D., Esq., Jungypore	1883
380	Maxwell, J. D., Esq., Merchant, Calcutta	1883
	McCaw, W. J., Esq., Merchant, Calcutta	1882
	McFarlane, A. C., Esq., Merchant, Calcutta	1870
	McIntosh, A. C., Esq., Merchant, Calcutta	1872
	McLeod, M. N., Esq., Pipra Factory, Chumparun	1883
385	McWilliam,* O. G. R., Esq., c. s.	1881
	Mengens, J. G., Esq., Merchant, Calentta	1865
	Mewburn, G. F., Esq., Merchant, Calentta	1874
	Middleton, J. A., Esq., Tinking Factory, Sissa P. O., Assam	1882
	Minchin, F. J. V., Esq., Aska, Ganjam...	1862
390	Mirza Mahomed Jahali Bahr., Prince	1883
	Mitchell,* R. W. S., Esq., Emigration Agent for Trinidad	1875
	Mohendrolall Khan, Koomar, Narajole, Midnapore	1871
	Mohesh Chunder Biswas, Baboo, Juinmoo, via Seal-kote	1882
	Mohis Chunder Chowdry, Baboo, Pleader, High Court, Calcutta	1880
395	Moir, Dr. W., Meerut	1883
	Momet, Miss de., Dooterial Tea Garden, Darjeeling	1883
	Moore, C. H., Esq., Merchant, Calcutta	1881
	Morison, Harry, Esq., Managing Proprietor, Koleapanie Tea Estate, Jorehaut, Assam	1880
	Morris, Capt. J. G., Cantonment Magistrate, Saugor	1883
400	Morrison, D. McL. Esq., Merchant, Calcutta	1883
	Morris,* E., Esq., Manager, Hong-Kong & Shanghai Banking Corporation	1874
	Mullen, Dr. T. French, Residency Asst. Surgeon, Ulwar, Rajpootana	1871
	Mullane, Dr. J., Civil Surgeon, Dhubri	1883
	Munro, Mrs. E., Calcutta	1882
405	Murray, J. C., Esq., Calcutta	1879
	Murray, A. L. K., Esq., Manager, Borpani Tea Estate, Nowgong, Assam...	1883

N.

NARAYAN RAO, Maharajah of Dewass, Indore	1874
Nassiruddeen Ahmed, Moulvi, Behar	1876
Navendra Narain Roy, Baboo, Jemooah, Khandi, Moorshedabad	1879

N.—(Continued.)

Admitted.

410	Narsing Row, Zemindar, Vizagapatam	...	1879
	Nawab of Jaora, H. H. the Jaora	...	1882
	Newson, W. H., Esq., Merchant, Calcutta	...	1876
	Nickels, C., Esq., Indigo Planter, Pussewa Eactory, Jounpore	...	1866
	Nobin Chand Bural, Baboo, Solicitor, Calcutta	...	1874
415	Nolan, Philip, Esq., Civil Service, Arrah	...	1873
	Norman,* Godwin, Esq., Broker	...	1882
	North, W. M., Esq., Bogracote Tea Estate, Silligoree	1879	
	Nottobur Sing, Rajah, Chowdry:bazar, Cuttack	...	1879

O.

OBHOCHURN GOHO,	Baboo, Merchant, Calcutta	...	1856
420 O'Brien, Dr. D., Beheating Tea Co., Debrooghur, Assam	...	...	1881
O'Keefe,* J. W., Esq., Merchant	...	...	1871
Openra Chundra Sing, Baboo, Bhaugulpore	...	...	1882

P.

PALMER, Captain, E. Post Officer, Chandbally	...	1883
Punde, T. C., Rajah of Pakour	...	1881
425 Parcell, W. G., Esq., Dehing Tea Co., Assam	...	1877
Paterson, James, Esq., Merchant, Calcutta	...	1881
Peppe, W., Esq., Birdpore, Goruckpore	...	1875
Perkins,* Dr. R. H.	...	1880
Pertab Narain Singh, Baboo, Depy. Magistrate, Bancoorah	...	1882
430 Phillips,* J., Esq., Manager, Government Farm, Al- lahabad	...	1875
Pigott,* William, Esq., Broker	...	1864
Pillans, C. H., Esq., Tea Planter, Phoolbaree, Silli- goree	...	1880
Pitcher, Major D. G., Cawnpore	...	1882
Playfair P., Esq., Merchant, Calcutta	...	1882
435 Political Agent for Supdt., Rajkumar College, Bun- dekkund	...	1876
Pope, C. H., Esq., Ackrigunge, via Nulhatti	...	1882
Poppe, E., Esq., Calcutta	...	1881
Porter, G. E., Esq., c. s., Judge, Gya	...	1880
Praunath Pundit, Baboo, Bhawanipore	...	1877
440 Pratapa Chundra Ghosa, Baboo, Calcutta	...	1869
Pratt, H., Esq., Calcutta	...	1880
Preo Nauth Sett, Baboo, Calcutta	...	1876
Prosonno Coomar Banerjee, Baboo, Calcutta	...	1871

P.—(Continued.)

Admitted.

Proprietors Jugdispore Estate, Beheea	...	1883
445 Protheroe, Major M., Supdt. of the Andamans, Port Blair	...	1881

Q.

QUINTON, J. W., Esq., Civil Service, Allahabad	...	1861
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R.

RADHICA PROSAD MOOKERJEE, Baboo, Dist. Engineer.	...	1883
24-Pergunah	...	1883
Rajah of Bood, Cuttack	...	1881
Rajendro Narayan Roy, Rajah, Joydebpore, via Dacca	...	1880
450 Ram Chunder Chatterjee, Baboo, Kallieno Cheera Tea Estate, Cachar	...	1882
Ramanymokun Chowdry Rai Bahadur, Zemindar, Rungpore	...	1861
Ram Narain Chatterjee, Baboo, Calcutta	...	81
Ramessur Maliah, Baboo, Howrah	...	1882
Rampini,* R. F., Esq., c. s.	...	1875
455 Rao of Cutch, H. H. the Bhujia	...	1882
Ramsay, Herbert, Esq., Tea Planter, Kurseong	...	1878
Rayson, J., Esq., Manager, Bangpara Tea Garden, Debrooghur	...	1877
Read, E. W., Esq., Manager Latookjan Garden, Assam	...	1883
Reilly, Herbert, Depy. Magistrate, Maldah	...	1872
460 Reynolds, C. B., Esq., c. e., Asst. Manager Weirora State Ry. Colliery	...	1883
Riach, T. S. M., Esq., Manager, Kinikor Tea Estate, Assam	...	1882
Ritchie, D. W., Esq., Offg. District Supdt. of Police, Furreedpore	...	1871
Robinson,* S. H., Esq., Merchant	...	1854
Romesh Chunder Mittra, the Hon'ble, Calcutta	...	1874
465 Ross, A. Esq., Dehree, Shahabad	...	1883
Rowett, R., Esq., Merchant, Rangoon	...	1877
Ruddock, Dr. J. B., Medical Officer, Messa, Kellyden, Assam	...	1882
Ruddock,* E. H., Esq., n. c. s., Rampore Beauleah	...	1868
Runglall Sing, Baboo, Bhaugulpore	...	1876
470 Rushton, H. P., Esq., Merchant, Calcutta	...	1879

S.

SA戈RE DUTT, Baboo, Merchant, Calcutta	...	1855
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S.—(Continued.)

	<i>Admitted.</i>
Samachurn Law, Baboo, Merchant, Calcutta	... 1850
Samanand De, Bahadoor, Rai, Balasore	... 1875
Samuells, C. A., Esq., c. s., Bancoorah...	... 1883
475 Sandford, J. R., Esq., Gowhatta ...	... 1883
Secales, Jaffray O'Brien, Esq., Bancoorah	... 1869
Schiller, F., Esq., Broker, Calcutta ...	... 1881
Scotland, J. P., Esq., Ex. Engineer, Buxar	... 1882
Secretary, Assam Company, Calcutta ...	... 1865
480 Secretary, Cantonment Public Garden, Agra	... 1865
Secretary, Cantonment Fund Committee, Morar	... 1878
Secretary, Local Funds, Raeporo ...	... 1874
Secretary, Local Fund Committee, Fezorepoie	... 1861
Secretary, Local Fund, Nimar, Khundwa	... 1873
485 Secretary, Municipal Committee, Mirzapore .	... 1869
Secretary, Municipal Committee, Prome	... 1876
Secretary, Municipality of Man, Ranipore, Jhansi	... 1878
• Secretary, Patna Municipality, Patna ...	... 1880
Secretary, Public Garden, Azimgur ...	... 1871
490 Secretary, Public Garden, Benares ...	... 1875
Secretary, Public Garden, Bhangulpore	... 1881
President, Public Garden, Monghyr ...	... 1882
Shaw, S. H., Esq., Tea Planter, Moheena, Golaghat	1882
Overlock, J. E., Esq., Calcutta ...	... 1878
500 Skinner, J. M., Esq., Senior Master Pilot, Calcutta	1882
Sheriff, W., Esq., Jorroda, Jessore ...	... 1859
Stillingford, G. W., Esq., Bogracote, Pillan's Hât, vî Silligorce... ...	... 1882
Shitab Chand Nahar, Baboo Azimgunge	... 1883
Shivaji Rayo, H. H., the first Prince of Indore, Holkar ...	... 1881
505 Shuttleworth, E. J., Esq., Bankipore ...	... 1882
Simson,* James, Esq., Civil Service ...	... 1856
Skinner, A., Esq., Delhi ...	... 1854
Sladen,* J., Esq., c. s., Meerut	... 1876
Smallwood, A. E., Esq., Broker, Calcutta	... 1875
510 Smart, J. F. N., Esq., Manager, Balagan Factory, Noakacherra, Assam ...	... 1880
Smith,* Maxwell, Esq ...	... 1881
Soppitt, C. A., Esq., Asst., Supdt. of Police, Cachar	1883
Spark, H. J., Esq., c. s., Rai Bareilly ...	... 1876
Spedding, R. D., Esq., c. s., Moradabad	... 1883
Spencer, Harrison, Esq., Tea Planter, Darjeeling ...	1874
Spenger, A., Esq., Ex. Engr., Upper Assam Divn., Debrooghur ...	... 1880
Sri Mohun Thakur, Baboo, Berarie, Bhangulpore ...	1877

S.—(Continued.)

		<i>Admitted.</i>
	Stalkart, William Esq., Merchant, Calcutta	1845
	Stalkart, J., Esq., Hope Town, Darjeeling	1863
515	Stayner, H. J., Esq., Maur. Jatookin Garden, Meleng, Assam	1883
	Steel, Octavius, Esq., Merchant, Calcutta	1874
	Steel, Donald, Esq., Eastern Cachar Tea Company, Cachar	1861
	Stevens, C. C., Esq., Civil Service, Calcutta	1875
	Stevens, H. W., Esq., Supdg. Engr., Durbhangā	1867
520	Stevenson, Geo., Esq., Civil Service, Sylhet	1873
	Stewart, Col. J., R. A., Cawnpore	1883
	Stokes,* Allen, Esq.	1867
	Stokoe, T. R., Esq., Barrister, Calcutta	1878
	Stratton,* J. P., Esq.	1873
525	Studd,* E. J. C., Esq.	1875
	Sturmier, A. J., Esq., Talooka Rajah, Cheriakote, P. O. Zumanea	1866
	Sukharam Martnnd, Esq., Indore	1872
	Sumbhoo Narayana, Rajah, Bahadoor, Benares	1872
	Superintendent, Chumba Estate, Chumba <i>via</i> Dal- housie	1881
530	Superintendent, Rambagh, Umritsur	1859
	Superintendent, Taj Garden, Agra	1874
	Superintendent, Central Prison, Benares	1871
	Superintendent, Serajunge Jute Company, Scraj- gunge	1868
	Superintendent, Botanical Gardens, Saharunpore	1878
535	Superintendent, Government Horticultural Garden, Lucknow	1879
	Surdharee Lal, Baboo, Zemindar, Bhaugulpore	1874
	Sutherland, Charles J., Esq., Merchant, Calcutta	1838
	Sutherland, A. B., Esq., Merchant, Calcutta	1870
	Syed Wilayat Ali Khan, Patna	1876

T.

540	TAYLOR, S. H. C., Esq., c. s., Beerbboom	1873
	Terveen,* W., Esq.	1877
	Thomas, G., Merchant, Calcutta	1882
	Thomas, G., Esq., Zemindar, Monghyr	1875
	Thomas,* J., Esq., Merchant	1867
545	Thomas, W. L., Esq., Merchant, Calcutta	1883
	Thompson,* H. E., Esq., Supdt., Govt. Telegraphs	1879
	Thompson, Hon'ble Rivers, Lieut.-Governor of Ben- gal, Alipore	1882

I.—(Continued.)

Admitted.

	Thompson, Col. W. B., Deputy Commr. Chanda,			
	C. P. ...	...	...	1879
	Thornhill, E. B., Esq., Civil Service, Aligurh	...	...	1875
550	Toomey, Geo., Esq., Indigo Planter, Contai, Tirhoot	...	1870	
	Tottenham, the Hon'ble L. R., Civil Service, Calcutta	...	1873	
	Tresham, W. C., Esq., Kainowli Factory, Benares	...	1879	
	Tucker, Robert, Esq., Tea Planter, Seesaugor	...	1867	
	Turner,* H. G., Esq., M. C. S. ...	...	...	1881
555	Twiss,* Col. A. W., R. A. ...	...	...	1881

U.

UMBER JUNG Bahadoor, Rana, Lieut.-General, Kat-				
mandoo, Nepal	...	...	...	1881

V..

VIKAR-UL-UMRAH Nawab, Hyderabad, Deccan	...	...	1883	
Voss,* C. W., Esq., Merchant	...	...	1864	

W.

	WALKER, William, Esq., Tea Planter, Seesaugor,			
	Upper Assam ...	...	...	1870
560	Wallace, Adolphus, Esq., Rungajaun Factory, Golaghat, Assam ...	...	...	1866
	Wallace,* Capt. W. A. J., R. E. ...	...	...	1880
	Waller, R. R., Esq., Merchant, Calcutta	...	...	1883
	Wallich, C. A. N., Esq., Tea Planter, Julpigoore	...	...	1881
	Wallis, A. H., Esq., Sec., Sungma Tea Assn., Calcutta	...	...	1882
565	Walters, C., Esq., N. B. S. Ry., Saidpore	...	...	1882
	Walton, T. Esq., Parbutipore	...	...	1878
	Warburton, Major, Political Officer, Khiber	...	...	1882
	Ward, G. E., Esq., Civil Service, Gowhatti	...	...	1873
	Ward, G. E., Esq., c. s., Jounporo	...	...	1878
570	Watson, A. G., Esq., Calcutta	...	...	1883
	Webster, R., Esq., Subornakhally	...	...	1879
	Weingartner, J. E., Esq., Loco.-Dept., Saidpore	...	...	1881
	West, R. Barton, Esq., Calcutta	...	...	1876
	White,* Philips, Esq.	...	...	1880
575	Whito, C. A., Esq., Asst. Engr., P. W. D., Hazaribagh	...	...	1883
	Whitney, F., Esq., Merchant, Calcutta	...	...	1875
	Whitty,* Irwin J., Esq., Civil Engineer	...	...	1867
	Whyte, Alex., Esq., Ranecgunge	...	...	1881

W.—(Continued.)

Admitted.

	Williamson, R., Esq., Calcutta	...	1881
580	Wilkinson,* Capt. C. J., Supdt. P. & O. Company	...	1878
	Wilson, H. F., Esq., Naraingunge	...	1870
	Wilson, A., Esq., Merchant	...	1879
	Wintle, Lt.-Col. H. R., Commanding at Futtehgurh	...	1880
	Wood, F., Esq., Hattowrie Facyt. <i>via</i> Bilaspore, T. S. Railway	...	1882
585	Woodman, J. V., Esq., Barrister-at-Law, Calcutta	...	1875
	Wood-Mason,* J., Esq., Asst. Curator, India Museum, Calcutta	...	1877
	Worsley, C. F., Esq., c. s., Mozufferpore, Tirhoot	...	1879
	Wright, W., Esq., Judge, Small Cause Court, Cuttack	...	1866

Y.

	Yule, Geo. Udney, Esq., Merchant, Calcutta	...	1879
590	Yates, R. B., Esq., Deputy Conservator and Harbour Master, Calcutta	...	1883

Z.

Zemin, D. J. Esq., Calcutta	...	1883
Zorab, Dr. J. M., Civil Surgeon, Balasoro	...	1882

JOURNAL
OF THE
Agricultural and Horticultural Society
OF
INDIA

RHEEA,

By W. H. COGSWELL, President, Agricultural and Horticultural Society of India.

Baehmeria nivea, Rhea grass, or China grass, known in Bengal as Riali, in Assam Rhia Kunkhoora, and in China as Tehouma, chumá, the Ramie of the Malayan Islands.

It is upwards of a quarter of a century since my first introduction to this fibre.

At the time I was a young novitiate in that centre of the world's commercial emporium, Mincing Lane, London, trying to qualify for a mercantile career in the East Indies.

I was expected to learn something of every thing that found its way to the metropolis, from all parts of the world, and to become more especially, an expert in East Indian products.

In my rambles through the Dock warehouses, shipping, and sample rooms of the city, I first saw Rhea, and I made more enquiries about it, than I could get satisfactory replies.

I was shown stems of the plant that were dry and withered, which in my ignorance I considered to be worthless

and beneath notice, but my feelings of disappointment were at once changed into surprise and great admiration, when I beheld the magnificent samples of fibre that had been produced from such apparent rubbish, when the plant was in its green state. Some of the samples of the finished fibres were as white as pure snow, and all were soft, fine, silky, of wonderful gloss, and of great strength and similar to that from which the famous China grass-cloth had been prepared, which was shown to me afterwards. I saw more, heard more, read more, and learned more of the article after my curiosity had been raised and my wonder excited.

I have been tempted into tracing these early reminiscences and penning a few remarks thereon, from having so very recently, a few days ago only, witnessed a series of experiments with this plant, with the view to separating its fibre by the aid of machinery.

These experiments were in connexion with the Calcutta International Exhibition, and there were three or four Machines driven by steam power tried, but none of them were found capable of producing a merchantable article in proper quantity, either in quality or condition to approach the lowest of the samples that first came under my early notice. Such Machines, however, will be dealt with separately in a different place, in connexion with the reports on the late Calcutta International Exhibition, as they constituted a part of the exhibits therein : that unsatisfactory result proved that little or nothing had been done to perfect a machine, capable of producing quantity and quality of fibre, on a remunerative, mercantile scale, and that the trade was almost in the same position, from the same want, it experienced nearly a quarter of a century ago, and that very little progress had been made in the needful direction.

I have been further induced to take up my pen on this subject, for at the close of last year a paper on "The preparation and use of *Rheea Fibre*" was read by Dr. Forbes

Watson before the Members of the Society of Arts, which, as might be expected, coming from such a high authority, was most able, and the important subject was well and exhaustively treated by him. He commenced, by asking, what is *Rheea*? He exhibited specimens of the plant in the dry, the semi-succulent, and one only, in the green state, explained how the bark and fibre were separated by hand only, as no machine up to that period had been found to do the work satisfactorily. He entered into an account of a machine and process to attain this end, known as the Favier-Frémy, and then described a new machine of Messrs. Death and Ellwood's make, the invention of Mr. H. C. Smith; he stated that he had reason to believe, that this last machine would answer the purpose, and he exhibited samples treated by it.

It was expected by Dr. Forbes Watson that this machine would have been tried ere this in Calcutta, and I understand it is to be at no distant date.

As might be expected from such an important and interesting lecture, the discussion which followed was conducted by men of great scientific attainments and practical experience with reference to the growth, cultivation, cutting and preparation of the plant for extracting the Fibre; much was elicited for the information and guidance of those who have yet to make a study of the subject, and the outcome of the discussion may lead to further enquiry and research.

I must confess to a feeling of disappointment when I rose from a perusal of the proceedings, for so much old ground was traversed and so little new was opened out, and it left a want, a something to lay hold of, to be seized, and developed into a tangible whole for future operations and guidance.

To those whose interests, or desire for fuller information on the subject, might lead them to make enquiry, I think a rough outline, or a *résumé* of what is known about

this very important product might prove useful and acceptable, and I therefore recapitulate the following facts taken from that store-house of practical research in these fields, the records of the Agricultural and Horticultural Society of India, bearing on this very important and most interesting subject; and from other sources dating prior to those records, or to the Society's existence.

In 1809—That very eminent practical Botanist, Dr. Roxburgh, was well acquainted with the useful properties of this plant and as far back as the year 1809, three quarters of a century ago, he brought it to the notice of the Indian Government in the letter which he wrote to the Secretary to the Board of Trade, which follows:—

"I have received your letter of the 17th instant, with the two extracts therein mentioned, and beg you will be pleased to inform the Members of the Board of Trade that since the beginning of my botanical career, no plant has given me more anxiety than that which produces the Caloee. From the receipt of the first sample sent to me by Mr. Ewer, from Bencoolen, I saw its quality was uncommonly interesting and promised to be superior to every other vegetable fibre I had seen. I was therefore more than usually solicitous to obtain the plant which produced so promising a material, as a substitute for both Hemp and Flax, and in 1803 four were received into this Garden (Royal Botanical Garden, Seebpore) from Mr. Ewer, at Bencoolen; since which period some thousand plants have been reared from these four, so readily does it grow and multiply. But to this day I have not been able to discover a ready way to clean the fibres. At present a man rarely cleans more than half a pound in a day, which alone comes to sixteen Rupees the maund. I understand the Malays in Sumatra follow the same mode of cleaning which I have hitherto found the best, *viz*: by scraping away the pulpy parts, &c. immediately when peeled from the freshly cut shoots; no kind of maceration nor coction

have I found to answer; however, as I have applied for information to various quarters, and am still making experiments myself, I do not yet despair of falling on a more profitable method than scraping.

The plant has every advantage we could wish in growing readily in this country, being perennial, and yielding three or four crops, or cuttings annually; so that if we can only overcome the obstacles that now present themselves in cleaning the material, I am inclined to think it would, in the course of time, supersede every other, for canvas and cordage, yet known, I would, therefore, by all means recommend as extended a cultivation as the plant will admit, which must be very limited for years yet to come, because it has not hitherto produced good seed, nor even from its native country could I ever obtain any, which is scarce to be expected from a plant usually reared from cuttings and slips, (as in the common pine-apple, plantain, &c.,) by a mode of culture which soon deprives them of fertile seed.

This plant must therefore be multiplied by suckers, cuttings and layers which can best be done during the rains."

In 1831—Mr. Lamb writing from Dacca to the Hon'ble Sir E. Ryau, then President of the Agri-Horticultural Society of India, sent a specimen of the *Rheea* thread from Assam, stating that it was much stronger than hemp, but the fibre, though fine, was not spun sufficiently flexible to make the substance so valuable as its strength promised, that the Assamese, used it to make fishing lines and that the plant was propagated by slips.

In 1835—Colonel Burney writing from Ava to J. Kyd, Esq., sent a small specimen of a kind of hemp brought from the Shan Provinces of Pivela and Youkzouk about a week's journey to the south east of Ava. Mentioning that the quality was very superior, and that it was regularly cultivated by the Shans, the bulb bearing root being readily propagated. This was confirmed by Mr. Landers, a traveller in the Shan country.

Major Macfarquhar likewise sent similar samples raised at Tavoy on the Tenasserim Coast. The stem grew five or six feet high, of the thickness of a man's forefinger, that it was cut down to the ground once a year, and that it would grow up again from the same root as often as the plant was cut, that the hemp formed a kind of rind or coat over the stem which might be taken off after macerating the stem in water, or not, the former process, however, made the hemp much whiter in color, although it deprived it of some of its strength and toughness, after rubbing or scraping off the cuticle of the bark, the stem was beaten all round and the fibre peeled off. From that material they manufactured every kind of cordage and wove a stout cloth from it. The Burmese called it Pün and knew it only as coming from the Shan Provinces, and called Goün. The bulbs were put into the ground in the beginning of the rains in March or April and by September or October the stems were big enough to be cut. This plant was identified as the "*Urtica Tenacissima*."

In 1836—Captain Jenkins of the Khassiah Hills sent a sample of Caloe or Rheea Fibre made by him from the "*Urtica nivea*," being grown in his own garden very readily and with little or no care or cultivation, the strength of which might be considered entirely unequalled and admirably adapted for cordage, nets, clothes, and good linens. At that time it was in universal use for the manufacture of fishing lines and nets; that there was at that period very little trade in it, being only grown in such quantities as the fishermen required, that its cost was ten rupees a maund, but as the plant could be grown with the least possible trouble, and the preparation of the fibre from it was a very facile process it was considered that it could be produced at half that price.

In 1847—Major Jenkins replied to an enquiry on the subject of the Rheea fibre of Assam, (Kunchoora fibre of Rungpore) "*Urtica nivea*," and its probable identity with the grass cloth of China to the effect :—"I thought that the plant from which

this beautiful article is made, was long known to be from the leaves of some species of Pandanaceæ, and I am surprised to find, after all our long intercourse with China, that we are still ignorant of the plant which produces it. We had, I thought, a near imitation in the fibres obtained from the pineapple and from a common pandanus. The fibre may be obtained from the *Urtica nivea* (our *Rheea*) but I think it does not seem probable, for we have no instance in which any fine thread is made from it, the finest being small twine for fishing lines and nets; it is a very excellent hemp but it appears to be quite destitute of that glossiness and coolness which are so much admired in the grass cloth, and I should doubt that any mode of preparation would give it the appearance of grass cloth. If the grass cloth is made from our *Rheea* the process of preparation should be enquired into; our people know nothing of it; neither do the Khamtis, Singphos, or Shans, who come from the borders of China, who all know the *Rheea* perfectly well, make any thing resembling grass cloth that ever I met with." Major Jenkins enclosed a note to his address from Major Hannay, announcing that the *Urtica Tenacissima* of Assam is identical with the grass cloth plant of China.

In 1849—Dr. Macgowan, of Ningpo, a corresponding member, sent to the Society some of the root, leaves, fibre and seeds of the chú má to see if it could be identified, and on these specimens being submitted to Dr. Falconer he was confirmed in his opinion that the chú má plant was the same plant as the *Bæhmeria nivea* of Botanists, described under the name of *Urtica Tenacissima* by Roxburgh; that the China specimens corresponded exactly with those grown in the Botanic Gardens with which he compared them. He also stated that Koempfer in the *Amœnitates exoticœ* gives "Máo" as one of the Japan names of the plant, and Thunberg in regard to its uses says "*Cortex pro funibus conficiendis, et filis validis ad texturas, expetitur.*"

Dr. Falconer also added that the seed which Dr. Macgowan sent along with the chú má grass cloth leaves from Ningpo, had vegetated in the Botanic Garden, and turned out different from the leaf specimens, the latter having been derived from Bæhmeria, while the seeds have yielded a corchorus (*C. fuscus* of Roxb.,) and that such a difference occurring in an article procured from the Chinese is readily intelligible, and that the case did not affect the evidence touching Bæhmeria nivoa, yielding the veritable grass cloth.

In 1853—Captain Dalton, Commissioner of Revenue, Assam, sent 15 bales of *Rheea* fibre, which had been prepared by Major Hannay, by great perseverance, expense and praiseworthy exertions, and which he placed at the disposal of the Board of Revenue and Government, which were sent home, reported on and noticed by scientific gentlemen and learned Societies. There was no question raised as to their quality and value, but in regard to the extension of cultivation of the *Rheea* to meet the probable demand, it was suggested that some assistance should be given on the part of Government.

Major Hannay sent five bales of this *Rheea* fibre to William Sangster, Esq., of London, who in returning thanks for the handsome present said that they were the first that had ever been imported into the country. Dr. Wallich saw them and he was much pleased, he considered they were a vast achievement and that he was entitled to speak decisively in the matter, because, to quote his own words, "I utterly failed in producing the article, as did one far greater than me, namely, the celebrated Dr. Roxburgh; so much more credit is due to Colonel Jenkins and to Major Hannay for their complete success." Mr. Sangster said it was only a question of time and the fibre must come into the market.

There must, however, be some mistake here as regards those bales having been the first to be imported, for in the year 1811, Dr. Buchanan sent three bales of the fibre from the Botanic Gardens at Calcutta to the Court of

Direction, which were reported on by Messrs. Sharp of Mark Lane, to the effect that a thread spun of that fibre bore 252 lbs., whereas the weight required to be borne by Russian Hemp of the same size, in His Majesty's Dockyards, was only 84 lbs.

Further, in 1815—The Society of Arts voted a Silver Medal “to Captain Joseph Cotton, of the Trinity House and a Director of the Hon'ble East India Company for his great exertions in the culture and importation of Calooee Hemp from the East Indies, the produce of a plant named by Dr. Roxburgh, *Urtica tenacissima*” to quote from Vol. XXXIII of that Society's Journal for 1815. In the correspondence which is there printed Captain Cotton alludes to certain pamphlets published by him on the subject; among the letters is one from “James Cobb, Secretary to the Hon'ble East India Company, forwarding a bale of about one hundred weight of “Calooee Hemp, prepared by Dr. Roxburgh during his residence in Bengal, which came to hand by the Ship *Cambridge* to England in 1812.” Further on Captain Cotton writes strongly commanding a machine of Mr. Lee's invention for extracting the fibre of the Calooee, “its operation is so simple and effectual that the wonder is no one should have before this introduced the idea,” he also recommends that some of them should be sent out to India so as to be able to manufacture all cordage and sails locally. It is very disappointing to find no description of this machine given. There is a foot note to these papers as follows. “It is a curious circumstance that at the time the Calooee Hemp, the product of Sumatra in the East Indies, was under the investigation of the Society, a similar plant and fibre was submitted to their consideration by Mr. Charles Whitlow, under the name of *Urtica Whitloena*, discovered by him on the borders of the various lakes in Canada; it is a perennial plant produced there in great abundance.”

In 1855—A specimen was sent down raised and prepared at Kangra in the Punjab, which compared most favourably

with samples from Mr. Marshall of Leeds.

In 1869—Dr. King contributed an able and valuable paper to this Society's Journal on the *Rheea Fibre* at the time he was officiating Superintendent of the Botanical Garden at Sabarunpore, dealing with this fibre yielding plant as also other fibre yielding nettles of the *Urtica* sp. giving the character of the plant, its limit of growth, suitable soil, shade, moisture, manure, propagation, cultivation, probable cost and production per acre, process of separation of the fibre, cleaning, bleaching, &c. as recorded by Dr. Royle and Major Hannay; and then after briefly alluding to the difficulty of extracting the fibre, he expresses an opinion that “until a cheap and simple machine be put within easy reach of the cultivator or a chemical process be invented, Indian grown fibre can never, I fear, enter into competition with China, and little progress can be made in extending its cultivation in this country.”

Lastly, for the most recent reference on this subject.

In 1880—The Government of Bengal wrote to the Agricultural Horticultural Society forwarding samples of *Rheea* fibre and letters from Messrs. Thomson and Mylne, shewing that the fibre had been prepared many years ago at Bhaugulpore by families of the Dhanook caste, for the silk weavers there, but that the particular samples sent had been prepared in the villages of their Jugdispore Estate, Beheea, and that it was their intention to try and create that valuable industry among the Rajpoot and Brahmin families resident there. They then go on to say that “the method for obtaining this fibre by certain natives of Bhaugulpore of the Dhanook caste, some eight or ten years, or still further back was generally as follows. The site of the little factory was chosen as near as possible to a stream of soft water, as the process is one of slow boiling or simmering, and beating in combination with washing. The factory plant, is an earthen or other pan or boiler, and two notched boards such as dhobies use. The

work people two men, two women, and two boys. The boiler is charged with water sufficient to cover the shoots prepared to be dealt with, and to it is added about 10 chittaks sujee-matee (fullers earth) per maund of plant placed in the boiler, the whole is then allowed to simmer, slowly for 1½ or 2 hours. The shoots are then taken by, or handed to, the nearest man with a notched board before him (the boards being placed near by, or partially in the water, dhobie fashion) in such portions as can be held firmly between his two hands, he continues to dash it against the Board washing it at the same time, thus clearing each end alternately of the wood and portions of the bark and gum. The handful is then passed on to the second man with a similar board who beats and washes it in the same way to free the filaments still further from gum and bark, after this it is taken back to the boiler to be again slowly simmered or boiled for about an hour. It is then again beaten and washed by the two men as before till the gum is removed and the filaments are free. The two women now take charge of it to be dried, beaten and drawn or carded till it is in the condition of the accompanying sample, but much whiter. A maund of shoots per hour can thus be easily worked off, which if filament is in the plant in the proportion of 2½% will be one seer of fibre fit for spinning by the native hand method, or for the carding machine if sent to Europe. If the percentage of filament in the plant is over 2½% the outturn will be increased in proportion while no addition is made to the cost. By adding half the original quantity of sujee-matee to hot water in the boiler it may be used again, afterwards the water should be changed.

We propose introducing the domestic cultivation of the *Rheea* plant, and preparation of fibre to the people of the villages on the Jugdispore Estate, in the hope that it may make a considerable addition to the family earnings, especially to high caste families, where women are as a rule purda-

nashin, and to whom it seems the preparation of the fibre would be a profitable means of passing time, otherwise useless. The plant being perennial and hardy would require little care from the men beyond perhaps loosening the surface and weeding every two months, and giving some manure twice yearly. Should any simple machine be required or found to be beneficial we have reason to believe that the want will be met by two small rollers on the principle of the native chirkee or cotton gin roughed on the surface, and working at different degrees of speed; this has been found to loosen and partially remove the bark and to some extent freeing the filaments from the gum or gluten by the drawing or triturative motion of the rollers so adjusted to each other."

Government called for a report on those samples, and as a Member of the Fibre Committee of the Agri-Horticultural Society, I had the privilege of submitting my views in the following remarks, in which the other member of the Committee concurred. "I consider this sample of *Rheea* to be one of the best specimens that has been submitted to me for a long time past, as regards its color, cleanliness, and soft, silky fibre, and its comparative freedom from gum and mucilaginous matter.

The fibre has not been destroyed by chemicals, as is so frequently the case in many processes, and, I think, but very little injured or weakened in its strength under the simple method said to have been adopted in its preparation. It is very short, owing, I think, to excessive hackling or combing, and a great waste must have been the result. Its value in consequence will be materially lessened. It is, however, admirably adapted for spinning and I would recommend that in the absence of spinning and weaving steam machinery, a sample of cloth be prepared by hand. It is, beyond all doubt, of great commercial value in Europe for blending with silk fabrics, and I advise that a good large

sample be sent to England to be properly and carefully valued, which I think it is quite impossible to do in this market."

Then in the same year, 1880, T. Sandys, Esq., of Bhaugulpore, wrote to the Government to the effect that he knew nothing of the Dhannook party, who, it was said, had removed to Synthia. He alluded to the fact that he had kept up a small cultivation of *Rheea* for experimental purposes for more than sixteen years, from cuttings obtained from Calcutta, Purneah, Dinagepore and Rungpore; that he had tried over a dozen experiments eventually discarding them all for one process. He had met with great reverses in the cultivation, the difficulties of which he regarded as only secondary to, if not equal, to those of the extraction of the fibre; from his experiences, well manured ground is essential, if healthy plants and good produce therefrom are looked for. His processes for the extraction of the fibre have not yet been made known, he says they are not immediate in action, but require time, and go to show that any violent, rapid extraction of the fibre is injurious to its strength. In its green state the fibre can be brought out white and silky in a few hours, but very much entangled and quite ruined.

From the foregoing mass of experiences it may, I think, be accepted, that as regards the growth and cultivation of the plant there is no difficulty, except perhaps in certain unfavourable districts, or soil, as experienced by Mr. Sandys, all my friends and correspondents, and nearly all the information which I possess from indirect sources, as also from direct personal, practical experiences, lead me, with some degree of confidence, to say that the plant is easily and readily grown.

It is now more than twenty years ago, since a friend returned from a tour he had been making in Assam, through several Tea gardens in which he was interested. He brought with him a few plants of the *Rheea* which

he gave to me, and from which I made some cuttings ; they struck, grew rapidly, and ultimately became fine plants, from which I propagated freely and formed a cultivation sufficiently large to satisfy myself thoroughly with reference to the ease of cultivation, and the capability of producing fine, strong, healthy plants from cuttings, this was within 14 miles of Calcutta, in, and round about which place, the plant thrives without any special care or attention. In fact the plant will grow almost anywhere ; it does not suffer during the rainy season, and long droughts produce in it very little injurious effects, but I can well understand that a damp soil and climate, with some shade, would produce more luxuriant growth than might be expected in hilly situations where frost and snow would be probably fatal to the plant ; it is at home in Assam, Cachar, most parts of Eastern Bengal, the valleys of the Himalayas, Burmah, Siam, Sumatra, China, Japan, Java, Mexico ; parts of Europe, notably in the south of France, Italy, Spain, as well as Southern America, are not strangers to its cultivation.

There is ample proof of capability in India to produce the fibre if the incentive is forthcoming to do so. Sow thick, or plant close, if seedlings or cuttings are to be put out, so as to insure tall, straight plants, free from lateral branches, and when the plant is coming into flower it is the best time to cut it ; in that condition the fibre procurable will be finer, softer and of much greater gloss, from what I choose to call the retention of the natural, essential oil which at that stage, in its real prime, the plant evidently possesses ; in fact this applies, in my humble opinion, to Jute also and to all other similar fibre yielding plants.

The older the plant is allowed to grow the coarser will be the fibre it yields, and the greater the difficulty in separating and preparing it. My plants blossomed about the close of the rainy season, at the break up of the monsoon in October. The little seed they did produce was quite of a sterile

character; some of the plants were 7 to 8 feet high when in full flower and ready for cutting, but they were evidently on the best soil, perhaps a good rich belt, for the average growth was about 5 feet high, all richly luxuriant and of deep green color.

Thus far the great desideratum has been a cheap and rapid mechanical process for freeing the fibre from the plant, on a scale sufficient to produce a paying commercial article.

It is well known that in 1870 and again in 1877, the Government of India, offered premia, aggregating £6,000 for the two best inventions of machinery for the preparation of this fibre. Mr. John Greig was the only one who responded to that first offer, and although the machine he produced fell far short of the prescribed requirements and conditions, yet he was rewarded £1,500 for the trouble and expense he had been put to, and as an inducement to him and to others, to persevere in their efforts to perfect an effective machine.

The second trial came off at Saharunpore in September and October 1879, seven competing machines were tried; none of them produced a fibre of sufficient value to justify grants of the prizes but the Committee recommended that some recognition was due to the inventors of some of the machines, as they possessed sufficient merit, and a grant of Rs. 5,000 each was made to Messrs. Nagona and Vander Ploeg and one of Rs. 1,000 to Mr. Cameron. Whilst regretting such a result, Her Majesty's Secretary of State for India, the Marquis of Hartington, said in His Lordship's despatch to the Governor General of India in Council, "with reference to the opinion expressed in Para. 8, of the Resolution that the *Rheea* grown in the drier parts of India is not likely to be able for the present at least, to compete successfully with the Chinese product, it is well that you should know that Mr. S. Anderson of Belfast is reported to have succeeded in producing by a mechanical process a finer *Rheea* fibre than

any yet seen in the English market and that he has been quite as successful with the stems grown in India as with those from China. A French manufacturer M. Laberic is also said to have been equally successful. On this subject I shall communicate with you again hereafter."

At the time those experiments were being carried on it was considered by many, capable of expressing sound opinions on the subject, that Saharunpore was not the place to have conducted them, nor was the time fixed for the trials altogether fortunate as regards the period of maturity of the plant to be operated upon. Having regard to the fact that some of the *Rheea* stalks had to be sent up from Calcutta, it would have been much more to the interests of the Exhibitors of the machines that they should have been tested in Bengal, where a better and fuller supply of excellent quality of *Rheea* could have been obtained than at the Botanical Garden at Saharunpore or in any place in, or near to, that district. The result would have been better I feel satisfied.'

Whilst Government have done much to encourage inventors of mechanical means and appliances for the satisfactory and complete separation and preparation of this fibre, I cannot help feeling that they have betrayed a retrograde policy in not renewing their liberal offers of premia. I do, however, indulge in the hope that their silence is due to an oversight, to some omission, and not because the results of those trials fell short of the requirements and conditions of the awards to be obtained under their offer, although it was patent that with a better and larger quantity of the raw material to be operated upon, and in a right district, the results might certainly have been more favourable.

In 1882, when as a member of the Fibre Committee of the Agri-Horticultural Society, I reported on some samples of *Rheea*, I felt constrained to venture the following opinion, "I note with regret, that the action of Government has been lately withdrawn with reference to the mechanical require-

ments that are necessary to produce this fibre, and I think they should renew and extend the terms of that premium, as it offered valuable inducement and gave great encouragement in the several efforts that were being made towards the accomplishment and full development of the right and needful object." And this I now repeat.

That assistance and recognition should still be held out; for profiting by the experiences gained in the working of those machines, and many others which have never publicly competed, but have nevertheless been privately tested, more perfect ones may result and in maintaining their offers of premia for the perfecting of simple, yet not costly, machines for a readier mode of preparing the fibre, Government would act wisely and well. Simple, light machines are wanted so that they could be carried to the cultivation where the fresh cut stalks could be at once operated upon, before fermentation had time to set in, and the gummy matter had time to adhere to the stalks and dry up, making the separation of the fibre afterwards almost an impossibility, and last, but not the least important feature, is the saving of transit charges for tons of stick and useless, fibreless, stalks, by having the machine carried to the place where the plant is growing. So also would Government act well, and very wisely, in the interests of the country if they held out some inducement, and needful encouragement to the Ryots to undertake the cultivation of such a new product on a proper commercial scale.

It has on more than one occasion been suggested that seed and land should be supplied gratis by Government for a time, and premia offered for the best quality and the largest quantity of clean fibre produced; for three or four years prizes of fixed sums per ton or maund, on all prepared fibre might be offered, and other similar inducements should be held out by Government as a beginning. *Rheea*, when once started as an industry, will make rapid and unbounded strides.

As a substitute for Flax, Cotton and other fibres it stands

unequalled, pre-eminently so. Whilst its strength is rightly pronounced to be the greatest of all fibres, yet it is fit for the finest fabrics, dresses, shawls, laces, silks, muslins, &c., and in short the difficulty lies in saying what it is not fit for, so numerous are the uses to which it could be applied.

As Cotton and Jutē were unknown to our ancestors and have become such important factors in the world's commerce, so may this fibre yet tend to enrich this and other countries beyond conception.

I need hardly point to Silk, to Indigo, to Tea, and to other equally important products, which have so materially aided in building up this country, but as they were originally, have been, and now are, so *Rheea* may likewise become, important beyond all measure.

Like they were in their infancy, so is *Rheea* at this moment; unknown to most, a sealed book to the many, and a difficulty to those few who are following it up with an interest keen and unflagging, with a dogged determination to try and overcome the obstacles that have hitherto surrounded it, the perfecting, of that which I firmly believe will be achieved, a machine to separate and produce a really merchantable fibre, in quality and quantity to supersede the hand-prepared material, which can only be produced at exorbitant and prohibitory prices.

This is no new theme, no novelty, as the foregoing resumé clearly discloses ; but so much deep interest is being created and centred in it, so many enquiries are being set on foot, and so many laudable efforts are being made to bring *Rheea* fibre to the front that I am in hope this paper may assist, even in a small degree, towards the desired end.

To some few it may be almost like the repetition of a once familiar tale, but to the many it will doubtless open up fresh fields, unknown and unexplored, and may assist to push on, prosecute and perfect, a work, the accomplishment of which must bring with it renown and success to all concerned.

CALCUTTA;

10th March 1882.

W. H. COGSWELL.

NOTE ON SUGAR-CANE MILLS,

By RICHARD BLECHYNDEN, Junior, Deputy Secretary.

Compared with Tea and Indigo, Sugar-cane is much neglected by European capitalists in India, unlike Jamaica, Mauritius, and the West Indies, where sugar may be said to reign supreme, though there, the Planter has to contend with enormous difficulties in the way of labor; yet India has probably as many acres under cane as the West Indies and Mauritius. The conditions under which Sugar-cane is grown in those countries, render the use of Mills of great power driven by steam, not only possible, but also the most economical way of doing the work. A method which finds little favor in India now, due possibly to the large sums of money lost in a period of great speculation, when mills were erected and factories opened at enormous cost, which it would have required golden harvests indeed, to make profitable.

The conditions which obtain now, however, are on a better basis, and give the cultivator a greater profit than he would have been likely to get, had the central mill system continued, the present plan being simply for each cultivator to mill the produce of his own field, boil the juice to a certain consistency, and sell such produce, either to the nearest sugar-maker, or to buyers who go their rounds annually, and whose purchases greatly affect the raw produce market. The question of prices, is, as usual in India, complicated by the custom of advances, interest of the money in kind, and other matter common to all dealings in products in India.

There is much that is interesting in the native method of conducting the milling operation, and the mills differ greatly in different districts. The following is a description of the mill used in some parts of Bengal, and residents in Calcutta must have frequently seen such mills being carried about in the streets, with bundles of cane, ready to be worked at a moments notice for the benefit of any thirsty soul who wishes to refresh himself with a drink of Cane Juice. The description

given below, is from Mr. S. H. Robinson's treatise, "the Bengal Sugar Planter," published in 1849, dedicated to the President, Secretary, and Members of this Society, of which Mr. Robinson was, and is, a Member.

"*Grinding.*—The Native Mill, universally used in the Burdwan District, is that composed of two horizontal wooden rollers, placed one above the other in close contact, and supported by their axes being passed through corresponding holes in two upright posts fixed firmly in the ground. Each roller has one end of its axis projecting several inches beyond the perforation in the upright post, and to these ends are fixed two pieces of bamboo, about three feet long, in the form of a cross, which are used as handles, or levers, wherewith to turn the rollers by hand; one such cross being at each end of the mill, and so allowing two men to work it at once. The rollers are about two and a half feet long and six inches in diameter, and the axes about half the size: the rollers are corrugated by being turned with grooves on them to facilitate the crushing of the substance of the cane between them.

Four men are required to be in constant attendance on the mill, two to turn it as above described and two more to feed it with cane, one sitting at each side of the rollers; the first feeder takes four or five canes in his hand and passes them through the mill; they are then handed back over the mill by his fellow on the opposite side to the first, who passes them through again, and so on for four or five times until the canes appear tolerably dry and flat; the first feeder then takes them collected in his right hand in a bundle, one end of which he introduces into the mill, and as the whole is drawn through, he twists them round with his hands in such a way, that the whole passes through something in the form of a coarse rope; this is the finishing stroke, and generally little or no moisture can be observed in the cane trash after this final pressure.

Any one who has seen this process in operation must feel satisfied that, notwithstanding its extreme tediousness, it

affords a very effectual mode of extracting the greatest practicable proportion of sap from the cane ; in this respect indeed, it may compare favorably with an ill-set, or ill-regulated, European mill, with its iron rollers and all improvements ; but my belief is, that the latter, if well set, the motion properly regulated, and the canes evenly and carefully fed, is quite as effectual in its result of juice extracted, though it can hardly be more so, than that of the rude native machine just described. For if the canes are tolerably long, so as to allow the native a good hold with his hands, and to give them a close and compact twist as they finally pass between the rollers, I am of opinion, that no arrangement of iron rollers yet used could be more effectual."

From the above it will be seen that Mr. Robinson has a high opinion of the extractive power of this style of mill rude and ineffective, though it must have appeared to all Visitors to the Agricultural and Horticultural Society's shed in the Exhibition, where one was kept at work.

Another mill the "Gandhi," used in parts of Eastern Bengal, Cachar, as well as in other parts of India, is of a more ambitious type. It is composed of two large heavy vertical rollers, held together by heavy blocks of wood, built in the form of a door frame, with the ends that are built into the wall in the case of door frames, much exaggerated. The lower block, or sill, is imbedded in the earth firmly, and it has a hole in the centre into which a receptacle is fitted to catch the juice expressed. The upper ends of the rollers have strong teeth cut out of the wood, in a spiral so as not to fall across grain, one of the rollers is longer than the other and is fitted at the top with the shaft which either bullocks, buffaloes, or men, drag slowly round, the squeeze is regulated by wedges, and can be made very severe, but the friction is out of all proportion and the creaking of the parts playing against each other, can be heard for a very long distance, particularly as the work is usually done at night.

A third form of mill is common to Behar, many parts of Bengal, and the North-Western Provinces ; it is well known as the Kolhu, or Oil Mill, and is very widely used for expressing oil. In the Society's shed at the Exhibition, a Kolhu was kept in full operation, where it caused a good deal of astonishment to European Mechanics.

It is thus described by Mr. Robinson in the treatise alluded to :—

“ The mill of the pestle and mortar construction is in far more general use, though varying in size and in the materials of which it is composed, in different districts.

In the Benares and adjacent districts, it has the mortar composed of stone, the basin which forms it being cut out of one end of a stone cylinder which is set upright in the ground. This basin is cut into two chambers or divisions, one over the other ; the upper being about a foot in diameter and the same in depth, with sides sloping inwards from the rim : the lower division, which opens from the upper, is of a hollow spherical shape, and about six inches in diameter. The pestle is made of hard wood, and of a shape to fit the mortar, being rounded into a ball at the lower end to fit loosely into the lower chamber, while the stem works round the inner surface of the upper basin, and crushes the pieces of cane which are four to six inches long, and thrown under it by the attendant workman as it gyrates. The pestle-handle is a pole twelve to eighteen feet long, standing obliquely from the mortar, and from its summit is suspended, by a long bamboo hanging perpendicularly down, a horizontal pole or boom, one end of which works against the outside of the stone cylinder by means of a semi-circular wooden rest, in the same manner as the gaff of a ship ; to the outward end of this boom, near to where it is suspended by the bamboo before described, are attached a yoke of oxen, which give the moving power to the machine by walking continually in a circuit round the mortar. A small hole from the base of the

lower chamber conducts the juice out at one side of the cylinder, from whence it falls into an earthen pot placed to receive it.

This is identical with the common oil mill used by the Natives throughout India, and applied with a few modifications to the expression of cane juice in more than half its districts; and this it does very effectually, however tedious the process. Throughout Dinagepore, Rungpore, Purneah, Bhaugulpore, Behar, Patna, &c., it is of a smaller size than above described, and the mortar is composed of a block of wood, of jack or mangoe tree.. The crushing power is increased by the weight of the bullock-driver, sitting on the end of the horizontal boom behind the cattle, and additional weight is also frequently given by blocks of stone or earth piled near him or forming his seat."

The circumstances of the Ryots have taught them the value of combination and it is nowhere more clearly exemplified than when the sugar-cane manufacturing season comes round. The different cultivators in each village then arrange among themselves as to the rotation in which their crops of cane are to be cut, and a mill is erected in a convenient spot, and all aid each other till the whole crop of cane in the village, cultivated by perhaps a dozen different individuals with separate interests, is worked off. The mill, being moved from place to place as may be convenient, a task involving some labor and trouble in the case of the Kolhu, and some hitches, before it is in working order again.

It is this power of combination which has rendered the introduction of a comparatively expensive implement possible and which has been seized on and worked, with such beneficial results to all parties concerned, by Messrs. Thomson and Mylne of Beheea. In districts where the stone Kolhus are used, it is customary for several ryots to combine to purchase one, their cost being from Rs. 60 to Rs. 80 about the same as the price of an improved roller mill.

It is from the above descriptions evident, that there was room for the introduction of an efficacious machine, portable, easily repairable, and comparatively cheap, and it will be clear from the table printed below, that three, at least, of the mills displayed at the Exhibition had all these qualities in a greater or less degree.

The trial of these different mills was held on the 1st February. Messrs. Thomson and Mylne were provided with a trained bullock they had got down for the trials from their headquarters at Goruckpore, but the other exhibitors finding the cattle they had procured unsuitable, it was finally agreed that all the mills should be tried with Coolie power. Messrs. Thomson and Mylne claiming a further trial with bullock-power. These conditions being agreed to, 36 lbs. of cane were weighed off for each mill, Messrs. Avery & Co. having courteously placed one of their perfect platform scales at the disposal of the Committee, which facilitated all work connected with the weighing, very greatly.

The first mill tried was Messrs. Death and Ellwood's, a pair of sensitised rollers on a heavy cast iron step, fitted to an upright post or stump, with bolts and nuts and a bracket. The spring which regulated the pressure of the rollers did not, however, appear to be strong enough, and the mill has given better results after being re-adjusted, at a private trial subsequently.

The next trial was with Mr. Cantwell's, No. 2 mill, the rollers of which are held together within a strong iron frame, which is again bolted on to uprights imbedded firmly in the ground.

The third was with Messrs. Burn and Co.'s "Shank's Patent," the rollers of which are on a bracket bolted to two cross pieces, and uprights imbedded in the ground.

The last was Messrs. Thomson and Mylne's, which is held together in a wooden frame, which is a frame and stand in one, and makes the mill complete and ready for use, as it has only to be carried to the field and four shallow holes

made to receive the legs. It has in this respect an advantage over the other mills which require deep holes to be dug to receive their stands, and cannot consequently be moved from field to field with the same ease.

The following table gives the figures compiled by the Committee appointed to watch the trial, and is, as will be seen, exhaustive:—

Rs.	Price.	Size of Roller.	Weight of Mill.	Amount of Cane crushed.	Amount of juice extracted.	Meffans.	Loss in Weight.	Time taken.	Juice %.	Loss %.	Crushing cane.	Extracting juice.	Capacity per hour.	
ood's ..	80	...	... 4 men	36 0	17 1	18 8	35 9	0 7	4 0	47 39	21 540	0 256	0	
... 70 {	8 x 10 8 x 5	502 10 502 5	4 " "	36 0	22 13	12 4	35 1	0 15	4 37	63 36	2 61 468	0 206	0	
Hank's)	80	8 x 7	449 10	4 " "	36 0	22 6	12 0	34 6	1 10	5 49	62 15	4 51 372	0 231	0
yne's...	80	8 x 7	346 8	4 " "	36 0	23 2	12 4	35 6	0 10	3 18	64 23	1 73 654	0 420	0
do. ...	80	8 x 7	346 8	1 bullock	36 0	23 14	11 12	35 10	0 6	4 7 1	66 31	1 04 524	0 347	0

In foregoing it will be seen that the Beecham mill is superior in all respects and it has also the great advantage of being self.

The percentages obtained are surprising, particularly when it is taken into consideration that the cane used, was necessarily not fresh; some of it having been cut probably two days, and also when it is remembered, that the time taken to crush a given amount of cane being one of the tests of efficiency, the mills were driven somewhat faster, than they would be in practice. It is laid down in "Sugar growing and refining" by Lock Wigner and Hasland:— "Repeated experiments all tend to prove that while only 46% of the juice is extracted by a speed of eight revolutions per minute, as much us 70% is obtainable by the same mill when the speed is reduced to $2\frac{1}{2}$ revolutions."

Comparing the best steam roller mill of modern construction with these portable implements is obviously unfair, yet this is what is said in a paper read in March 1871, before the Society of Arts, by Ferdinand Kohn, Esq., C. E.:— "The average yield of juice produced by the old sugar mills ranged from 50 to 60 per cent., while the best construction of modern mills gives an average yield varying from 65 to 70 per cent. of juice upon the weight of the cane. There are many eminent manufacturers of sugar mills in this country and on the continent, who claim for their mills a superior power of extraction amounting to 75 per cent. of juice, and who not only guarantee this result, but actually succeed on trial to reach this proportion. There is, however, a great and unavoidable difference in practice between the results obtained by a skilfully conducted trial of a few hours and the real average of an entire season's work, and it is at present, well established by experience, that the best of the "guaranteed" mills rarely reach the figure of 70 per cent. as the actual average yield of juice in practical working. The maximum extraction of juice by mechanical pressure, practically applied to sugar-cane, realises therefore a yield of 70 per cent. instead of the theoretical quantity of 90 per cent. actually held in the cane."

These remarks apply to Steam mills ; of course the climate, soil, and season have a direct effect on the yield of juice, and figures are misleading unless they relate to experiments made under identical conditions ; still it is obvious that a very high class of mills is now placed within easy reach of the Ryots ; and the fact that they are being widely purchased, proves that the Ryot is quite awake to the fact, and also shows that when an implement is really adapted to Indian conditions, and can pay its own cost either by improvement in quality or yield, the cost of purchasing it is not a deterrent.

The following extracts taken from a paper read before the Royal Agricultural and Commercial Society of Demerara, published in the "Sugar Cane" of the 1st January 1884, gives some figures, which though not relating to India, indicate the immense waste going on yearly in sugar manufacture in this country, through imperfect implements.

"I think it would be a fair estimate to assume that the juice expressed, taking the mills collectively throughout the colony, equals 62 per cent. of the weight of the canes, but as we would rather be over than under the mark let us assume that 63 per cent. is obtained. The difference between this, and what might be obtained, may be fairly considered a loss which the planters sustain through imperfect crushing, but as it is still an open question how much juice may be profitably expressed by crushing, we will take a low figure and assume that 70 per cent. only could be expressed. The difference between 63 and 70 may be fairly taken as the loss in cane juice, and by throwing this into figures, I find that it represents a loss of 111 on every 1,000 tons, and on the whole colony crop of 130,000 tons it represents a loss of no less than 14,430 tons of sugar, and if we estimate this with its offal at 120 dollars per ton, it presents us with the large sum of 1,731,600 dollars as the amount that we are carelessly throwing away ; and after allowing one-third of this sum for

extra cost of manufacture we have still more than 10,000,000 dollars of actual loss due to imperfect crushing."

If statistics could be compiled showing the loss in this country in a similar manner, the total would be so enormous, that few probably, would believe it.

While these sheets were in the press, further information came to hand, the result of a trial held at Habhigunge Mela, Sylhet, during February last, under the Superintendence of Mr. G. W. Pearce, c. s., Assistant Commissioner, between Messrs. Thomson's and Mylne's Mills and a Mahagandhi, the following results were obtained. The comparatively small percentage of juice in this occasion is due to the cane being long cut and exposed to rain.

MILL.	ROLLERS.		Men feeding Mill.	Cane.	Juice extracted.	Time.	Density of Juice Baume.		CAPACITY PER HOUR.			
	Length. In.	Diameter. In.					Sr.	Ch.	Ms.	Sc.	Sr.	Ibs.	Ibs.
Native "Gandhi"	39	5 $\frac{1}{4}$	4 men	2 men	20	10	11	6	30.7 $\frac{1}{2}$	53.44	379	197
Beheea Mill ..	8	7	4	" 1	20	11	7	5	0.7 $\frac{1}{2}$	57.3	480	274
Native "Gandhi"	51	8 $\frac{1}{2}$	6	" 2	100	48	8	22	30.7 $\frac{1}{2}$	18.8	534	250
Beheea Mill ..	10	8	6	" 1	100	55	8	22	15.7 $\frac{1}{2}$	55.8	540	300

In competition

A difference of about $3\frac{3}{4}$ lbs in one instance and 7 lbs in the other, in favor of the Beheea Mill. The Goor, prepared under the same conditions, was sent to the well known expert Mr. Laker Macmillan for analysis, an extract from his Report is subjoined :—

Beheea Mill goor is No. 1, and that from the Gandhi is No. 2.

			1	2
Crystallisable Sugar	...	...	49.73	44.57
Uncrystallisable Sugar	...	...	29.40	26.30
Water	...	...	9.60	11.20
As%	...	...	.90	1.35
Soluble organic matter	...	...	9.97	16.11
Insoluble organic matter	...	...	.40	.47
Total	...	100.	100	

Here again the percentage of crystallisable Sugar is 5.16 in favor of the Beheea Mill or taking both crystallisable and non-crystallisable sugar 8.26, that is to say the use of one of these Mills saves a loss of from 8 to 15 per cent. over the Native Mill. The disparity would be still greater if comparison were made with juice expressed by the "Kolhu" for as that implement grinds the cane in a receptacle, a percentage of the expressed juice is again soaked up; besides the great accumulation of dirt, fosters fermentation to which cane juice is so peculiarly liable and which is so destructive to its properties.

**NOTE ON THE SAL TREE IN THE SONTAL
PERGUNNAHS,**

By C. F. MANSON, Esq., Deputy Collector and Deputy Magistrate.

SHOREA robusta (Roxburgh), Beng. Sal, Hind. Sakwa, Sont. Sarjom.

This is undoubtedly the most common tree in this district, it is to be met with every where, both as scrub, and big timber, but there are very few if any trees which have arrived at maturity, for although about one hundred years ago, this district was for the most part one dense forest, principally of *sal*, the Sontals as they immigrated from the South-West, cleared all before them, building their houses, and using as fuel and for agricultural implements, the timber they felled, sparing only the Mahwa, and a few other fruit trees, and a small clump of *sal* for their place of worship (Jahir thán.)

Within the last 20 years, however, and especially of late, much attention has been paid to the preservation of this valuable timber tree, and the many patches of tall straight timber which are now to be met with, form one of the few pleasant features of this dry barren country.

But, I think other trees are equally deserving of a share of the attention which has hitherto been given almost exclusively to *Sal*, and I hope to draw attention to those most deserving of preservation, and extension, in future notes.

The *Sal*, flowers in April, and the seed which ripens about the end of June germinates almost immediately. This tree which becomes perfectly destitute of foliage by the end of February, throws out its new leaves very rapidly about the first week in March, when it is very welcome to the cattle, there being literally no grass at that time; goats less dainty than other animals eat even the dry fallen leaves.

It is the leaf of the *Sal* which is used for the leaf plate (*putri* and *pat*), on which the natives eat their rice, these are made principally by the Sontal, and *Bhuiya* women, and

from 60 to 80 are sold for one pice. An expert woman will make 240 such plates in a day, so that the employment is not a very lucrative one; the "*Mudhi*" or village grocer and the "*Halwai*" or sweetmeat maker are the principal purchasers of these plates, as they always keep a supply for sale, and for wrapping their commodities in.

When bamboos cannot be obtained, the Sal osiers are split in half, and used in their place, for roofing, fencing, and the like; saplings of 3 to 5 years, are used for rafters, or as the natives call them "rollers," of native huts, those of a greater growth serve the same purpose in Europeans' houses, and for posts and beams. Young Sal timber being nearly all sap wood is rapidly devoured by white ants and the several kinds of wood weevil; to prevent the inroad of weevils, the timber should be cut during the dark half of the moon, and to submerge it for 15 to 20 days is also a good deterrent. It is also asserted that the timbers cut in December and January are particularly free from, whilst those cut in June and July are particularly liable to, attack by these insects; another manner of rendering timber less vulnerable, is to cover it lightly with dry leaves, and fire it, so as to give it a thinly charred surface; the heart wood of old trees is however extremely hard, and durable, and resists both white ants and weevils. Sal grows to over 100 feet in height with a girth of 8 to 10 feet, and very straight.

The Sal yields a fragrant scented resin called "*Dhuna*," which is extracted only by paharias, and exported to Purundapur, Cynthia, and Bhaugalpur, the best sort in 1880 sold for 10 Rs. per maund; in 1881 the lowest price for bad quality was Rs. 2 per maund.

The *modus operandi* for extracting the *Dhuna*, is to cut out from 2 to 5 narrow strips of the bark, according to the size of the tree, about 3 or 4 feet from the ground, in the month of July, these grooves fill up with resin in about twelve days, when it is gathered and the grooves left to fill up again; they

give three yields, the best trees yielding as much as 10 lbs. the color varies from white to yellow and red, the first yield being the white and the best in purity, and size of nodules; a second crop in October, and a third in January is also obtained from the same wounds, but the yield is poor, and of very inferior quality.

I understand that the Zemindars have, since the year 1882, stopped the tapping of their trees, as the cess they levied, eight annas per axe was not commensurate with the damage done to their trees. The bark is said to be used as a tan, and to be valuable as such, and in Chota Nagpur to be used in the preparation of red and black dye (Dr. Watt's Eco. Pro.)

The seed of the Sal is eaten by the Sontals, and other low castes—it is stripped of the long wing, like permanent calyx, and boiled for two or three hours mixed with wood ashes, it is then washed several times to free it of the ashes then mixed with mohwa flowers, and re-boiled; a sufficient quantity is cooked at one time to last the family for two or three days. The seed is said to be capable of yielding an oil.

A NOTE ON THE TREES IN THE SONTAL PERGUNNAHS,

Deserving of special protection by the Forest Department.

By C. F. MANSON, Esq.

I do not know whether it has been noticed before, but it appears a very noticeable fact, that wherever the forest has been preserved in this district, the *sal* not only predominates, but has usurped almost entire possession of the preserved tract. The deeper one goes into the forest the more purely *sal* one finds it, whilst in all the tracts where the *sal* is in a state of scrub, almost every variety of tree to be found in the district is more or less plentiful, and yet, though the *sal* is thus strong to protect itself, it is to the protection of *sal* that almost all the energies of the forest officers are given.

The question arises, is the *sal* worthy the first place in the forest which it has been accorded? I do not think it is; for although it is of very rapid growth in its early days, and is thus enabled to over-top and smother its competitors, it is very slow in reaching maturity, and until it does reach maturity its only recommendations are its straightness, and equality of length and thickness, which makes it very handy for rough and temporary buildings, especially as rafters, but at this stage owing to it being mostly sapwood, it has a great drawback in its proneness to *Goon* and attack by white ants. I do not wish to deride the *sal* which is undoubtedly one of the most useful Timber Trees, but I think it strong enough to take care of itself, and that other trees which have not its vitality should have the special attention which they require, that is, that they should be nursed through their babyhood and protected from the *sal*.

The Trees which I consider are deserving of this attention are the following:—

GROUP I.

Albizzia lebbek, Anogeissus latifolia.

Barringtonia acutangula, Bignonia suaveolens, Careya arborea, Dalbergia dalbergioides, Eugenia calyophyllifolia, Gardenia latifolia, Hymenodictyon excelsum, Lagerstræmia parviflora, Stephegyne cordifolia, Stephegyne parvifolia, Pterocarpus marsupium, Semecarpus anacardium, Symplocos racemosa, Terminalia arjuna, Terminalia bellerica, T. chebula, T. tomentosa.

GROUP II.

Albizzia procera, Boswellia thurifera, Dalbergia latifolia, Diospyrus melanoxylon, Eugenia jambolana, Feronia elephantum, Gmelina arborea, Melia azadirachta, Schleichera trijuga, Sterculia urens, Tamarindus indica.

GROUP III.

Adenanthera pavonina, Diospyrus Embryopteris, Pterospermum acerifolium, Cæsalpinia sappan.

A forest of the first group might be obtained by selecting a patch of scrub where any one or more of those trees appear numerous, and uprooting or cutting down the *sal* until they have reached such a size that their own shade may be sufficient to give them the mastery. This need cost the department nothing, as the villagers would be only too willing to cut the *sal* for fuel.

In the second group are trees generally found solitary in the open, or at most in twos, or threes, but the ground around them is generally thickly covered with young seedlings, and if it were hoed up and protected from cattle until the young trees have reached a height of 10 or 12 feet, patches of pure forest of all these trees might soon be obtained.

In the third group are trees which might be reared in plantations, as is being done with *Tectona grandis*.

To rear young forests, it is imperative that the grazing of cattle, and especially goats and sheep, should be strictly prohibited.

I now beg to point out the several uses of the trees enumerated above, in support of their claim to special protection.

GROUP I.

1. *Albizzia lebbek*, Benth.

Syn. *Mimosa sirissa*, Roxb. *Acacia speciosa*, Willd.

Vern. *Pata-siris*, Beng. *Chaput-siris*, Sont.

Said to grow throughout the district in all soils and situations. It is a moderate sized tree and yields an excellent, hard, dark, durable timber. "It yields a gum, which is said not to be soluble in water, but merely to form a jelly. The gum resembles gum-arabic. Mr. Baden Powell says that, under the name of *Lera*, it is used as an adulterant for pure gum arabic in calico-printing, and gold and silver leaf cloths." "The bark is used in tanning leather" (Dr. Watt's Eco. Pro. of India.) "The seeds are used by the Natives in the treatment of piles, and as an astringent in diarrhoea. The flowers are employed in the cure of boils, eruptions, and swellings,

and act as antidotes to poisons. The leaves are useful in ophthalmia, and the powdered bark in ulcers, and especially in snake wounds. The oil extracted from the seeds is given in cases of white leprosy" (Drury). Cattle eat the leaves. The seed ripens in February.

2. *Anogeissus latifolia*, Wall.

Syn. *Conocarpus latifolia*, Roxb.

Vern. Dhau, Hind. and Beng. Hesel. Sont.

In this district it is only a moderate sized tree; it is very plentiful throughout the district, especially as scrub, being constantly cut for fuel and grazed down by cattle. The timber is hard and tough, it is used in building native huts for beams, but not for uprights as it soon rots in the ground. Its principal use is for cart-axles, ploughs, and the *mohan* or pestal of oil and sugarcane mills. It yields a gum, and the leaves are used in tanning. The seed ripens in the beginning of March.

Dr. Watt in his Eco. Pro. of India, says—

Gum—"It yields a gum, which is extensively sold for use in calico-printing. It occurs in clear straw colored, elongated tears adhering into masses, some times honey-colored or even brown, from impurities. As an adhesive gum it is inferior in strength to gum-arabic, and in consequence of which it commands a much lower price in Europe, the more so since it is nearly always mixed with the bark of the tree, sand and other impurities, and adulterated with the brown tears which are probably derived from some other plant than *Anogeissus*. In India the reputation of this gum stands high with calico-printers, especially of Lucknow, and it is probable it possesses some specific peculiarity justifying this preference, since it is used with certain dye-stuffs such as with *haldi* (*curcuma longa*), while gum-arabic or *babul*, is used with madder (*Rubia cordifolia*). *Dhawa* or *babligum* is generally collected in April."

"Dr. Dymock informs me that the leaves are in Bombay used as a tan. Mr. Duthie reports that they are also used

as a tan in the N. W. Provinces. They were analysed by Dr. Lyon and found to contain as much tannin as those of the Sumach tree."

3. *Barringtonia acutangula*, Gaertn.

Vern. Ijal, Hijal, Hijola, Beng. Hinjol, Sont.

A small tree of 20 to 30 feet, very branching, found in all localities, apparently used only for fuel. Roxburgh, however says it grows to be a large handsome tree, and Drury quoting McClelland says—"The wood is hard, and of a fine grain, red, and equivalent to mahogany." Dr. Watt in his Eco. Pro. of India, says—"The bark is used as a fish intoxicant, and also for tanning." The root and seeds are said to have medicinal properties. Cattle do not eat the leaves. It flowers during the rains.

4. *Bignonia suaveolens*, Roxb.

Syn. *Stercospermum suaveolens*, D. C.

Vern. Párul, Beng. Párar Hind. Párer, Sont.

A very fast growing tree with a straight trunk rising to a height of about 60 feet. Grows with *sal*. Cattle are fond of it whilst the leaves are young. Flowers during hot season, April and May, flowers, large bell-shaped, dull crimson, and exquisitely fragrant. The fruits are strung for necklaces, and worn to stop nose bleeding. The timber is used in building, where not exposed to damp, in the ground it soon rots.

"The root and the bark are used in native medicine as a cooling decoction. The bark yields a gum, one of the dark-colored Hog or Tragacanth series." (Dr. Watt's Eco. Pro. of India.)

5. *Careya arborea*, Roxb.

Vern. Kumbi, Beng. and Sont.

A large tree, grows in all localities. Yields a good timber, at present it is principally used for the heavy block wheels of the Sontal Cart and such like purposes. It is of a mahogany color, well veined, not very heavy, and takes a polish. The Cabinet-makers of Monghyr are said to use it. The bark of

the trunk and root is used as a fish intoxicant, cattle seem to be fond of the fruit, and eat the leaves slightly.

Gum, tan, fibre.—Dr. Watt in his Eco. Pro. of India says, “It yields a brown gum, specimens of which, and further information much required. It forms with water a tolerably thick mucilage of a dark brown color.” “Bark used for tannin.” (Kurz). “Its bark gives a good fibre for coarse cordage.” (Gamble). “It is used in Mysore as a slow match to ignite gun-powder.” (Cameron).

6. *Dalbergia dalbergioides*, Hooker.

Syn. *Ougeinia dalbergioides*, Benth.

Vern. Panjan, Hind. and Beng. Roth, Sont.

A large tree, found in the several chains and hills only. The timber is very hard, close grained, heavy, and takes a fine polish. It is of a rich brown color, well adapted for furniture as it does not seem liable to warp or crack easily. It is exceptionally good for building purposes as it stands damp and the action of the soil, and is not attacked by wood weevil. Wounds in the bark yield an astringent deep red gum. Flowering time the hot season. Seed ripens in September and October.

“The seeds yield oil of which almost nothing further than this fact is at present known. Specimens of this as of the other oil from *Dalbergia* are required.” (Dr. Watt’s Eco. Pro.)

7. *Eugenia caryophylifolia*, Lamk.

Syn. *Eugenia calophyllifolia*, Wight.

Vern. Chota Jam, Beng. Kodh, Sont.

A moderate sized tree, found in all localities, very common in the scrub about Dumka. Yields a good, hard, durable timber. Cattle eat the leaves. The fruit is eaten, but is smaller and of a lighter color than *E. Jambolana*. “The wood is whitish, very strong, close grained, hard, and durable.” (Roxb.) “Said to yield a gum, somewhat like kino.” (Dr. Watt’s Eco. Pro.)

8. *Gardenia latifolia*, Willd.

Vern. Popreo, Apri, Beng. Popro, Sont.

A small tree of slow growth. The timber is much sought after by the native comb-makers of this district, but it does not appear to be put to any other use. Cattle eat the leaves. The fruit, which ripens in March and April, is eaten by natives.

9. *Hymenodictyon excelsum*, Wall.

Syn. *Cinchona excelsa*, Roxb.

Vern. Bhorkhorn, Beng. and Sont.

A moderate sized tree, found in all localities. "The wood is firm, close grained and of a pale mahogany color," (Roxb.) It is used for beams, cart-wheels and other purposes but does not last well in the ground. "The infusion of one fresh leaf in water all night had little taste, but struck quickly a deep purplish blue with a chalybeate. The two inner coats of the bark possess both the bitterness, and astringency of *Peruvian bark*, and I think when fresh in a stronger degree; the bitterness is not so quickly communicated to the taste on chewing the bark, as that of the former, but is much more durable" (Roxb). "The inner bark is used as a febrifuge and for tanning; and the leaves as a cattle fodder." (Dr. Watt's Eco. Pro.)

10. *Lagerstræmia parviflora*, Willd.

Vern. *Sida*, Beng. Sekre, Sont.

A pretty large tree, common in all localities, cattle do not eat the leaves. "The wood is very hard, and reputed an excellent timber. It is light brown, close grained, straight, and elastic." (Drury). It is much used for the yokes of ploughs, carts, and such like purposes, it does not last well in the ground. Dr. Watt in his Eco. Pro. says—"It yields a sweet gum." "The bark is used in tanning" (Gamble). "In Midnapur it is also used in dyeing skins black, along with the bark of *Terminalia tomentosa*" (Dr. McCann).

11. *Stephegyne cordifolia*, Hook.

Syn. *Adina cordifolia*, *Nauclea cordifolia*, Roxb.

Vern. Keli kadam, Beng. Kàràm, Sont.

This tree is found in the same localities and put to the same uses as *S. parvifolia*. It grows to a very large size, a tree in *Monza* Jakia, taluq Kendua, is said to measure 18 feet girth, and about 100 feet height, and very straight. Cattle do not appear to eat the leaves of this tree. Roxburgh observes, "The wood of this tree is exceedingly beautiful, its color is like that of the *boxtree*, but much lighter, and at the same time very close grained. It is to be had of a large size, from one to two feet or more in diameter, and is used for almost every purpose where it can be kept dry. For furniture it answers exceedingly well, being light and durable."

12. *Stephegyne parvifolia*, Hook.

Syn. *Nauclea parvifolia*, Roxb.

Vern. Bara kadam, Beng. Ghore, Sont.

This tree is found both on the Hills, and in the Valleys, it of very rapid growth, grows to a large size, and its timber used for beams, cart-wheels, and other purposes, it makes good fuel, it does not bear exposure to damp, and is therefore of no use for posts. Roxburgh observes, "The wood is of a light Chesnut color, firm and close grained, is used for various purposes where it can be kept dry." Native combs are made of it when *Gardenia latifolia* is not obtainable, there can therefore be little doubt that the timber would be useful for any purpose where a close grained, light, tough wood is required. Young trees require to be guarded, as cattle eat the leaves greedily both fresh and dry.

13. *Phyllanthus emblica*, Willd.

Vern. Amla, Beng. Aura and Aula; Hind. Meral, Sont.

A small elegant tree, found throughout the district in all localities. Timber used for rafters of native huts, it does not cast in the ground. The fruit is eaten both raw, pickled and preserved. It is also sold for the manufacture of ink, and for hair wash. Cattle eat the leaves.

Gum.—Dr. Watt in his Eco. Pro. of India says, “ It yields a gum.”

Dyes and Tan.—“ The fruit is the emblem myrabolan, used as a medicine and in dyeing and tanning. The leaves are also used in tanning in most parts of India, along with Terminalia, shorea, &c., in fact the leaves of this plant are regarded as one of the best tans by the Bengal *Chamars*. A black dye is obtained from the fruit, along with myrabolans and sulphate of iron.”

14. *Pterocarpus marsupium*, Willd.

Vern. Pitsal, Beng. Bijisá, Hind. Murgha, Sont.

A very tall straight growing tree, found with sal, large trees very scarce, young plants moderately plentiful, young saplings are much cut down for walking sticks, and cattle are very fond of the leaves and young branches. Flowering time, the beginning of the rains (July.) Seed ripens in February, owing to its wide leafy margin it is carried a considerable distance from the tree by the strong west winds. The young seedlings have only three leaflets, not five and seven as in old trees.

“ It yields the red-gum-resin called ‘ kino’ a valuable astringent, much used in medicine. The juice is extracted when the tree is in blossom by making longitudinal incisions in the bark, it is collected in a receiver and dried. The hardened juice consists of blackish-red angular, pea like grains, partially soluble in water but almost entirely so in spirits of wine. It might be used as a source of tannin if sufficiently cheap.” (Dr. Watt’s Eco. Pro.)

“ Considerable quantities are exported from Malabar, its properties are similar to those of catechu, but being milder in its operation, is better suited for children, and delicate females.” (Drury).

The heart wood imparts a yellowish brown color. “ It is an oil-yielding plant” (Dr. Watt’s Eco. Pro.)

The timber is a dark reddish brown color, very hard, and not attacked by white ants. It takes a good polish.

15. *Semecarpus anacardium*, Corom. Pl.

Eng. The Marking-nut-tree.

Vern. Bhelwa, Beng. Soso, Sont.

A small tree ranging from 15 to 30 feet in height. Very common throughout the district, and in all localities. Flowering time July to September. Fruit ripens in January and February.

The seed yields a black acrid juice, used principally for oiling the axles of the country carts, it is also used for blisters, and other medicinal purposes, for burning, and in the groves of *Terminalia foermentosa* preserved for rearing the tasser-worm, a ring of this oil is often painted round the trunks of the trees, two or three feet from the ground, to prevent any insect inimical to the worm ascending the tree.

*The oil would probably make a good preservative for wood used in the same way as tar or pitch.

The manner of extracting the oil is as follows:—

A small earthen pot is sunk in the ground mouth upwards, on the top of this is placed a larger earthen vessel having a small hole punched in the bottom, this vessel is filled with the seed, the mouth closed up with an earthen saucer, and plastered over with clay, the whole is then covered with dry twigs and leaves which are set fire to; the heat expels the oil which drops through the hole into the smaller vessel below. The yield is roughly one fifth of oil to four of refuse. Oil is also extracted from the trunk of the tree in the same manner that is followed with the *Gärjan* (*Dipterocarpus burbinatus*), but the yield derived in this way is very small, and the process only resorted to on emergency.

The oil does not appear to be sold in the bazars, every ryot makes what he requires for his own use. The seed, however, is exported in small quantities towards Calcutta, being employed by native washerman in Bengal for marking linen.

Dr. Watt in his Eco. Pro. of India, says—

Gum.—“The tree yields a gum, sample of which has been

sent by the Madras Forest Department to the Amsterdam Exhibition."

Oil, Varnish, Ink.—"The pericarp is full of an acrid juice which is used in native medicine. A black varnish is made from it, and, mixed with lime water, it is used for marking linen." (Brandis).

"The pericarp of the fruit, contains a bitter and powerful astringent principal, universally used for marking ink, hence this is called the marking-nut. It is commonly made into ordinary ink, which is improved by the addition of lime water."

Dye.—"Dr. McCann reports that in Balasore it is used as a black dye."

Tan.—"Pounded and boiled in rape oil, (the fruit) makes an excellent remedy for staying putrefaction when begun in hide" (Buck, Dyes and Tans of N. W. P.) Roxburgh remarks. "The juice or resinous balsam is not soluble in water and is only diffusible in spirits of wine, for it soon falls to the bottom, unless the menstruum be previously alkalized; the solution is then pretty complete, and of a deep black color. It sinks in but soon unites perfectly with expressed oils. Alkaline livixia acts upon it with no better success than plain water."

Dye.—The bark is mildly astringent, gives out in decoction a deep color, which dries brown of various shades.

Gum.—From wounds made in the bark, a dirty looking, brownish, soft gum is procured, which dissolves slowly in the mouth without much taste."

The fruit on fleshy seed-cup when ripe is eaten by the Sontals and poorer classes; when fresh it is very astringent although sweet, but when wizened in the sun, or roasted in wood ashes it becomes palatable.

The timber does not appear to be of any use, it grows to no great size, and is soft; it is occasionally used for posts, but soon rots; as a fire wood it is no use, as its fumes cause

a swelling of the face, hands or any other part of the body that may be exposed.

The tree has rather a handsome foliage, and when bearing fruit, is with the bright orange seed-cup, and deep black seed very striking.

The young leaves are eaten by cattle. It would be useful to know what the demand for this seed and oil would be and what prices they would be likely to fetch in the Calcutta market.

At present there cannot be less than two to three hundred maunds of this oil consumed yearly in this district, and I am confident that if a fair price offered there would be 400 or 500 maunds obtainable in the market. The Forest Department should I think experiment by planting out an acre of land with these trees, say 8 feet between each tree in the line and 15 feet between the lines. The most suitable soil would I think be a piece of flat land in one of the small valleys amongst the hills.

16. *Symplocos racemosa*, Roxb.

Vern. Lodh, Beng. Lodham, Sont.

A small tree 12 to 20 feet high. It is found in all sal and most other forests, but never with bamboos. Cattle eat the leaves. The bark of this tree is to be found in all native druggists shops; the Sontals boil it and use the liquor as a mordant to fix the color imparted by the root of *Morinda exserta*, and also as an eye wash. "Lodh is an ingredient of Munjeet or East India madder." "Abir, the red powder used by natives during the Holi is made from the bark of this tree." (Roxb.)

"Its chief use is as a mordant, the ashes being used as an Alkali (See *Rubia Sikkimensis*), or as an auxiliary with other dyes; sometimes it is used as a tan. In the Central Provinces it is regarded as one of the most valuable tans. (Dr. Watt's Eco. Pro.)

17. *Terminalia arjuna*, Beddome.

Syn. *Pentaptera arjuna*, Roxb.

Vern. Kawa, Hind. Arjun, Beng. Kowa, Sont.

This tree grows to a large size, is found on the hills to the South West of Dumka, and in the plains, it prefers a loose moist soil being generally found near streams and water courses; it is of quick growth, and yields a good timber, used principally for making the wooden measures so common in this District, known as *Pai*, *Paila*, and *Powa*.

Dr. Watt's in his Eco. Pro. of India, says—

Gum—“It yields a brown translucent gum.”

Dyes and Tan.—“The bark, is a tonic, and astringent, used sometimes in dyeing and tanning like most other members of this genus, but it seems to serve as a concentrator of color rather than as a dye material. It is, however, said to give a black dye with *babul* (*acacia arabica*.) The fruit is not mentioned as being used as a myrabolan, and is probably inferior to the others.”

18. *Terminalia belerica*, Roxb.

Syn. *Myrabolanus belerica*. Gaertn.

Vern. Bâhâra, Beng. Lapong, Sont.

This tree grows to an immense size, and in all localities. It is common throughout the district. The wood is white and somewhat soft, but is used for doors, boxes, the solid wheels of the country cart, and for various other purposes. “The kernels of the fruit are eaten by the natives; they taste like filberts, but are reckoned intoxicating, when eaten in any quantity.” (Roxburgh.)

The tree fruits abundantly, the drupe which is the size of a large nutmeg, is an article of export from this district.

Gum.—“From wounds in the bark, large quantities of an insipid gum issues, it much resembles *Gum arabic*, is perfectly soluble in water, burns away in the flame of a candle, with little smell, into black gritty ashes.” (Roxburgh).

Dr. Watt in his Eco. Pro. of India, says. “It yields copiously a gum which, apparently is of no economic use.”

Dyes and Tan.—“The fruit is one of those exported from India under the name of myrabolans, and is largely used in dyeing and tanning; native ink is also made from it. The leaves and the fruits together are often used in tanning.”

Oil.—“The oil which the seeds yield, separates into two portions, the one fluid, of a pale green colour, and the other flocculent, white, semi-solid or as consistent as ghee. It is used medicinally, and chiefly with the object of strengthening the hair.”

19. *Terminalia chebula*, Retz.*

Syn. *Myrabolana chebula*, Gaert.

Vern. Harrà, Harraki, Beng. Rol, Sont.

Common throughout the district, both on the hills, and in the valleys and plains, growing to be a moderately large tree, and yielding a serviceable timber, but one which soon rots in the ground or exposed to damp.

The drupe when green is made into a preserve, which when made with good sugar is by no means unpalatable; the old city of Nàgar in Birbhum is the principal place of manufacture. The fruit of the *aula* (*Phyllanthus emblica*), is frequently preserved with it. The dry fruit ground and the powder mixed with water is applied externally for sore eyes.

A considerable quantity of this myrabolan is exported from this district.

Gum.—Dr. Watt in his Eco. Pro. of India says, that this tree “yields a gum.”

Dyes and Tan.—“The bark is used for tanning and dyeing, and the fruit gives the black myrabolans reported to be of better quality than the myrabolans from *T. belerica*. They are exceedingly valuable, the produce of a single tree being worth Rs. 2,000. The fruit consists of a central solid mass, from which the valuable rind is separated and pounded. After mixing it with water and allowing it to soak for a time, the solution is ready. The cloth is steeped once or twice and dried, and then placed in the dye solution. With

iron salts it gives a black dye; with turmeric and indigo, a green and with catechu, a brown. In all these instances the *harra* is a concentrator or vegetable mordant to the actual colours. With alum, the fruits give a yellow dye."

Oil.—"The seeds yield a clear, transparent, almost colorless, fluid oil, used medicinally, and only to be had in small quantities."

The tender leaves and twigs are often covered with galls, they are powerfully astringent, and make as good ink as oak galls along with iron, they are also used in dyeing and tanning.

20. *Terminalia tomentosa*, W. & A.

Syn. *Pentaplera tomentoca*, Roxb.

Vern. Asan, Hind. and Beng. Atna, Sont.

This is a quick straight growing tree, and rises to a considerable height, it is an useful timber for building purposes. It yields an edible sweet gum. In this district it is the principal tree upon which the *tusser* worm is reared, for which purpose it is often preserved in groves and pollard. Cattle eat the leaves.

Gum.—Dr. Watt's in his Eco. Pro. of India, says. "It yields a brown gum."

Dye and Tan.—"The bark is used for tanning and dyeing black, and the ashes yield lime eaten by natives in *pán* (Gamble). The bark is largely used as a tan; it imparts the characteristic red color to native leather, and cut up in small pieces and boiled for 6 or 8 hours, it gives a brown dye; along with the bark of *Mimusops Elengi* it is used to produce a red dye in jute. It gives a black dye with iron."

GROUP II.

1. *Albizzia procera*, Benth.

Syn. *Acacia procera*, Willd. *Mimosa elata*, Roxb.

Vern. Safed Siris, Hind. Kori, Beng.

A moderately large tree. "Occasional in forests, but scarce" (Gamble).

"This tree yields large quantities of gum." "The bark is sometimes used as a tan." (Dr. Watt's Eeo. Pro. of India.)

An excellent timber tree, with a tall straight trunk.

2. *Boswellia thurifera*, Roxb.

Syn. *Lignum thurifera*, Colebrooke.

Vern. Salui, Hind. Sále, Mal. Salga, Sont.

Grows to a large size, is found throughout the district, but not plentiful, and as a large tree is actually scarce. The tree strikes readily from cuttings, even large branches placed in the ground will take root. Cattle eat the leaves. The resin is collected for private use but not for sale, owing to the scarcity of large trees. The Sontals consider it a very good timber for posts, as it appears to remain in a living state; Hindus and Paharias never use it in their houses. When used otherwise than as posts it soon dries and decays, the timber of old trees however is said to be hard and durable.

"The gum resin, *alaigugal*, occurs as a transparent golden yellow, semifluid substance, which slowly hardens with lime. It is pungent, having a slightly aromatic taste, and balsamic resinous odour. It becomes opaque when immersed in alcohol or in water, the proportion of resin to gum being much smaller than in Frankincense. The opaque, soft, whitish mass produced by water when rubbed in a mortar, forms an emulsion. Indian Olibanum is consumed almost entirely in Central and Northern India and is never exported. (Dr. Watt's Eeo. Pro. of India.)

3. *Dalbergia latifolia*, Roxb.

Vern. Sat-sál, Sit-sal, Beng, and Hind. Satsayar, Sont.

Found in all situations, but rather scarce. A greenish black wood with light colored veins, giving it a very beautiful appearance, it is very fine grained and takes an exquisite polish, it is rather heavy, very hard and durable, it is admirably adapted for furniture and cabinet work. Flowers during the rains and seed does not ripen till February or March. Cattle eat the young leaves.

"The seeds yield oil of which nothing further than this fact is at present known. Specimens of this as of other oils from *Dalbergia* are required" (Dr. Watt's Eco. Pro. of India.)

4. *Diospyrus melanoxylon*, Willd.

Eng. Ebony.

Vern. Kend, Beng. and Hind. Terel, Sont.

This tree is plentiful throughout the district in all localities and grows to be a large tree. It is much cut down for fuel and walking sticks, cattle and goats also eat it down. It is used for ploughs, pestals for husking dhan, and other purposes. Large patches of scrub of this tree are to be found which would produce pure forest if preserved, it is also common in mixed scrub. The fruit is eaten and in the month of February is commonly sold at 100 for the arua in the hâts. A gum is occasionally found on this tree which is collected by native doctors, though I have not ascertained for what purpose. Roxburgh says the bark is astringent, and powdered and mixed with pepper is given for dysentery.

5. *Eugenia Jambolana*, Lamck.

Syn. *Syzygium Jambolanum*, D. C.

Vern. Jám, Jáman, Kala Jáman, Beng. and Hind. Soh, Sont.

This tree is found in all situations, it is fairly straight and rises to a considerable height. The timber is hard, close grained and durable, both in dry and damp places, it is particularly well suited for bridge piles, and is used for a variety of purposes. Cattle eat the leaves. The fruit is sold in the Bazars and hâts.

Roxburgh says—"The bark is strongly astringent and dyes excellent durable browns of various shades, according to the corrosive employed on the strength of the decoction."

"It is said to yield a gum somewhat like kino."

"The bark is used for dying and for tanning. In Assam, it is used along with the red munjit dye to impart brilliancy to the color. In tanning it is often combined with Garan

bark (*Ceriops Roxburghiana*)," Dr. Watt's Eco. Pro. of India.

6. *Feronia Elephantum*, Correa.

Eng. Wood or Elephant-Apple.

Vern. Kath-bel, Beng. Kainta, Sont.

A middling sized tree. Found mostly on the low and flat lands. The wood is hard and durable. The fruit is eaten by the natives mashed up with salt and chillies.

Dr. Watt in his Eco. Pro. says. "It yields a brownish or reddish, with a small proportion of clear yellow, gum soluble in water; said to have been sent from Madras to the Panjab Exhibition. Ainslie says that it is used by dyers and painters, particularly miniature and chintz painters. It is also employed in making ink and varnish, and by brick-layers in preparing certain cements and plasters. It occurs in irregular tears, semi-transparent or brownish. The *Pharmacopœia of India* pronounces it as superior to gum-arabic for medicinal purposes." "It forms a stronger mucilage than gum-arabic, but is not identical with it. It is precipitated by acetate of lead." (Dymock.)

Oil.—"The seed has been mentioned as yielding an oil but beyond this nothing is known."

7. *Gmelina arborea*, Roxb.

Vern. Gumbar, Gamár, Beng. Kasmár, Sont.

This is a large tree, found in all situations, but not plentiful. "The wood of such trees as will square into logs from 18 to 24 inches resembles Teak more than any other sort I have yet met with, the color is almost exactly the same, the grain rather closer, at the same time it is fully as light, if not lighter, and as easily worked; from experiments made it was found to endure exposure to sun and water alternately better than teak. It is said to be used for the decks of boats, as it shrinks and warps less than other timbers known in Chittagong and Dacca." (Roxburgh.)

Here it is much sought after for building purposes. The

frame of the native drum called ‘*dol*’ is made from it, as it is light, strong, and does not warp. The kernels are eaten raw by Sontals. Flowering time the beginning of the hot season. Cattle eat the leaves.*

8. *Melia Azadirachta*, Willd.

Syn. M. indica, Brandis. *Azadirachta indica*, Adr. Juss.

The Nim or Margosa tree.

Vern. Nim, Beng. and Sont.

This tree is found in all localities throughout the district, it grows to a large size, one in the sub-divisional officers compound at Dumka, is over nine feet in girth three feet from the ground, and about 40 feet in height; the trunk is short, but it has an immense head of large wide spreading branches. When in full foliage it is a very handsome tree.

Dr. Watt in his *Eco. Pro. of India*, says—

Gum.—“A gum, used as a stimulant exudes from the bark. Birdwood includes it among the gums which make up the Gum Gattie of commerce.”

Fibre.—“The bark yields a fibre, of which a specimen, supplied by the Madras Forest Department, was sent to the Amsterdam Exhibition.”

Oil.—“From the fruit is extracted, by boiling or pressure a fixed, acrid, bitter oil (margosa), deep yellow with a strong disagreeable flavor. It is used medicinally as an antiseptic, and anthelmintic.” (Brandis).

“Dr. Maxwell has found this oil as efficacious as cod-liver oil in cases of consumption and scrofula.” (Balfour.) Sir W. O’Shaughnessy, says—“The oil is thought anthelmintic, and is applied externally to foul ulcers, and used as a liniment in rheumatic and spasmodic affections, and in headaches from exposure to the sun.”

Dr. Dymock says, the oil “is applied to suppurating, scrofulous glands, is given in leprosy and a variety of diseases.”

* *Note*.—The lacquered, envelope and glove boxes, made in Birbhum, are made of this Wood.

' During the winter months in India the oil solidifies, becoming fluid in summer. It is sometimes burnt in lamps but emits a heavy and disagreeable smoke. Its antiseptic property would seem to show that, if made into soap, it would be found very serviceable for the purpose of washing sores, especially when healing up. It makes a good, useful, hard soap. Should a trade in this oil arise with Europe, an unlimited supply might be obtained from the vicinity of our large towns, and within easy access to the Railways.'

A decoction of the leaf is drunk by the natives for some stomach disorders, and is also given to cattle.

The oil is applied to the head by persons troubled with lice, which it is said to destroy.

The leaves are strewn on the floors of places infested with fleas.

The timber is of a light yellow color, hard and heavy, is it used for many purposes, amongst which the most prominent are oil presses, cart wheels, beams, and planks for doors, &c. The wood is particularly serviceable for any purpose where it has to remain in or on the ground as white ants do not attack it.

This is the only wood of which idols of "Jaganath" are made.

9. *Schleichera trijuga*, Willd.

Vern. Kusum, Beng. Bárú, Sont.

A very fine, hard, red timber but now become scarce. The timber is used for many purposes by the natives. The tree rises to a height of about 60 feet, with a girth of 6 feet. It is about the best of the lac producing trees although not used for that purpose in this district. The bark is astringent, and the natives use it for the cure of itch rubbed up with oil. The acid fruit which ripens in May is eaten by the natives. The seed produces an oil fit only for burning; but the fruit being eaten, and the trees scarce, the seed is rarely collected for oil. Dr. Watt does not mention this tree

amongst those which yield oil in his Eco. Pro. of India, but he says it exudes a yellowish resin. Cattle eat the young leaves. From the above it is evident that this tree is one deserving of protection by the Forest Department. If the land to a distance of 30 feet was ploughed up round a few old trees, and fenced in to prevent the grazing of cattle a stock of young trees would soon be obtained.

10. *Stereulia urens*, Willd.

Eng. Spectre-tree.

Vern. Búli, Beng. Guhu, Hind. Selheg, Sont.

A large tree, scarce, but to be found in all situations. It yields a useful red timber which lasts well as posts. Drury says, "the outer soft white wood is used to make the native guitar." The seeds are eaten roasted and said to be very palatable. Cattle eat the leaves.

Gum.—"It yields a gum called katila or katira. This belongs to the pale or Tragacanth series. It is inferior but is issued to the Government hospitals in Bombay instead of Tragacanth. It has been valued in Europe at only 20 shillings a cwt. Dr. Dymock, however says that under the name of Karaigond it is largely used in Bombay in the manufacture of native sweet-meats." (Dr. Watt's Eco. Pro.)

Roxburgh says "I observed, that the water in which I kept the green branches for examination, became thick, like a clean glutinous jelly. Bark exceedingly astringent, tinges the spittle reddish."

The liber yields a good fibre, specimens of which are reported as having been sent to the Paris Exhibition from Bera (Dr. Watt's Eco. Pro.) It may be noted that *S. colorata* and *S. villosa* are also to be found in this district, though scarce, (Gamble) and they both yield fibre, if not gum also.

11. *Tamarindus Indica*, Willd.

Eng. The Tamarind.

Vern. Tentul, Beng. Amlí, Imli, Hind. Jojo, Sont.

Common throughout the district in all situations, and

is one of our largest trees. The fruit made into 'sherbet' is a gentle laxative and stomachic, besides being a pleasant cooling drink. It is much used by the natives in their curries or with dal, they also use it as a chutney, mixed with chillies and salt. It is the acid used in curing the Hilsa fish and gives to it the name of Tamarind fish. It is used by native silver-smiths in cleaning silver jewellery. The seed after the brown shiny covering has been removed by boiling, is boiled and eaten with mohwa flowers by the Sontals and others. "The stones pulverized and made into thick paste with water, have the property when applied to the skin, of promoting suppuration in indolent boils. Boiled into a paste with thin glue they form one of the strongest wood cements," (Drury.).

The young leaves dried, powdered and mixed with salt are used as a pleasant acid flavoring to rice by the natives. A heated mash of the leaves is used as a fomentation for sprains.

"An infusion of the leaves is used in preparing a fine fixed yellow dye, to give those silks a green color which have been previously dyed with indigo; also simply as a red dye for woollen stuffs." (Drury.)

"The flowers and fruit are used as an astringent in dyeing, especially along with safflower; it acts the part of a mordant."

"The seeds yield a clear, bright, fluid oil, with somewhat of the odour of lin-seed oil, (Dr. Watt's Eco. Pro.)"

The peculiar double headed mallet of the cotton carders (dhunyas) is made from the wood of this tree, it being very heavy, hard and firm.

The tree is easily reared from seed.

GROUP III.

1. *Adenanthera pavonina*, Willd.

Eng. Red Sandal Wood.

Vern. Ructa-chandan, Beng. Bir-mungara, Sont.

Found in the Ranibahal Hills, and at Dumka. "It grows to be a very large tree, with an erect trunk. The interior wood of large trees is of a deep red color, very hard and durable. *The colored wood of this tree is used for a variety of economical purposes. The wood yields a dye, and is employed by the Brahmins after religious bathing in marking their foreheads." (Roxburgh.)

"It yields a gum (Spons' Ency) known in Ceylon as madatia. The seeds of this plant yield an oil." (Dr. Watt's Eco. Pro.)

2. *Diospyrus embryopteris*, Pers. Beddome Brandis, Kurz, Gamble.

Syn. *Diospyrus glutinosa*, König.

Vern. Gaub, Beng. and Hind. Garaterel, Sont.

"Found in river bed; very scarce." (Gamble). It is more common in the low lands of Rajmahal. The fruit is said to be eaten by the natives, the timber is inferior to *D. Melanoxylon*. "The fruit yields a gum, used in book-binding, and as a substitute for tar to make boats water-proof. It is a dark brown rather earthy looking resin, with a bright fracture." "The extract of the fruit is of the color, and consistence of Shell-lac." (Dymock). An infusion is used by fishermen all over Bengal for preserving their nets. "The fruit is also largely used as a tan, being a powerful astringent. By simply steeping the half-ripe fruit in water a brownish liquid is obtained which is sometimes used in dyeing a brown color. This is made into a good black by being combined with myrabolans (*Terminalia chebula*), and proto-sulphate of iron (*hirakash*). An oil extracted from the seed by boiling, is used in native medicine." (Dr. Watt's Eco. Pro.)

The Gaub liquor, for paying the bottom of boats, is mixed with the ashes of a small shrub known in Eastern Bengal as *Sitki*, without this ash the cracks in old boats are not filled up, and the color is a reddish brown instead of black.

3. *Pterospermum acerifolium*, Willd.

Syn. *Pentapetes acerifolia*, Linn.

Vern. Makchan, Beng. Machkunda, Sont.

Introduced from Suri by Mr. W. M. Smith, Deputy Collector. In the Darjeeling Himalayas it grows up to an altitude of about 3,000 feet. It is there known as Hatipaila in Nepalese. It grows to a height of about 60 feet and yields a light reddish, hard timber, which would be serviceable for a variety of purposes. I had thought the trees at Dumka P. Suberifolium, but Mr. Gamble in his list has given them as P. Acerifolium. These trees should be planted in some moist valley in the hills to give them a fair trial.

4. *Cæsalpinia sappan*, Linn.

Syn. *Parkinsonia aculeata*.

Eng. Sappan wood, and Jerusalem thorn.

Vern. Tairi, Teri, Beng.

I have only met with this in the Rajmehal Sub-Division on the low lands lying between the hills and the Ganges. The seed is used in the preparation of *misi*, with which some natives blacken their gums, and which is said to relieve tooth-ache, and reduce the swelling of the gums. It is also used for manufacturing ink, and in tanning leather, for which latter purpose it is said to be very good in rendering the leather soft.

Dr. Watt in his Eco. Pro. of India says—"The wood yields a valuable dye which is largely exported. The dye is also said to be prepared from the pods (tairi), from the pith, from the bark, or from all together. The pods are used in Monghyr along with proto-sulphate of iron to give a black color. Sappan wood is largely used in calico-printing, its price being about Rs. 12 a cwt., chips of the wood steeped in water yield the red color. This is intensified by alkalis, combined with turmeric and sulphate of iron it gives the color known as Kalejai. With Indigo it gives (Sausni) purple. Sappan color, however, is not permanent, being formed through the presence of the soluble substance *Brazilin*. Sappan wood is used with alum to communicate to starch the red color which converts it into *Gulal*, the red powder used in the *Holi* festival."

**SIR HERBERT MACPHERSON'S SILO IN THE
ALLAHABAD FORT.**

Communicated by GENERAL SIR H. MACPHERSON, K. C. B.

A SUBTERRANEAN chamber, which, 300 years ago in the time of the renowned Akbar probably served for the imprisonment of State Prisoners, was selected for the purpose, in August last. Sunk in solid masonry foundations it was only necessary to build up two or three openings, which in more recent times had been made for purposes of light and access, to convert it into a most useful silo, at once thoroughly water and air-tight. Every facility for accomplishing this was afforded by Major Swinton, Commanding at the Fort. and the cost came to Rs. 32.

The grass selected for the experiment grew handy inside the Fort, on the slope of the ramparts, and throughout the main ditch. It was the first crop, grown entirely by the monsoon rain, and in particular that from the ditch was of such forced growth that it might almost be described as rank grass. Two varieties predominate, "Janewar" (*andropogen bladii*), and "unjun" (*pennisitum cenchroides*). Of dhoob (*cynodon dactylon*), very little is to be found within the Fort, and what there is has evidently been introduced, the constant tendency being for the varieties "Janewar" and "unjun", to overgrow and extinguish it. Both "janewar" and "unjun" are first-rate fodder grasses, the latter being reputed "one of the best of all the wild grasses for forage, both for cows and horses." (Steuart).

The grass was cut during the 19th and 20th, and 21st of August, and cast into the silo daily as cut, through an aperture knocked in the upper part of the outer wall near the roof of the chamber. Cutting took place with the *hussia* and *dharanti*, and not with either the *khurpa* or *jhabhao*. The labour was paid for by the day, as the operation being expe-

rimental, it was thought desirable not to prolong the filling operation, beyond a few days. This made the cutting more expensive than would have been the case had the quantity cut been paid for by weight, at the usual rate of 3 pice per maund. A few coolies inside the silo spread the grass evenly as it was thrown in, but beyond this there was no compressing of the grass at the time of filling in. Considerable stress is laid by Professor Thorold Rogers and other writers on ensilage, on the necessity of chaffing the fodder to be stored, and of adding salt to it, and this is probably the first experiment tried in India, where grass has been ensilaged without these precautions. Much of the grass was two, to three feet long, and of a strong luxuriant growth, and that taken from the Fort ditch was moist, and some even dripping wet when put into the silo. Other grass again taken from the raised interior of the Fort was of a light fine description, and semi-dried by the hot sun, ere it could be cast into the pit. When filled the silo measured 17½ feet long, 14½ feet wide, and 11 feet deep. On the top of the grass two or three maunds of bhoosa (white) was spread, giving a dressing of about an inch in depth, and over the bhoosa 75 old wooden sleepers were laid horizontally as close as they could lie, but owing to the irregularity of many of the sleepers, numerous interstices occurred between them. Care was taken not to lay them too close to the sides of the silo, so that they should not bind against the walls as the contents settled. Upon the sleepers were placed 28 tons of round shot (cannon ball.) Including the weight of the sleepers, the average weight was 280 lbs. to the superficial foot.

Opinions vary greatly as to what amount of weight should be used, but it may probably be accepted that for unchaffed strong Indian grasses it should not be below 200 lbs. to the square foot, and may advantageously be as much as 300 lbs. The object of the weight is to compress the forage, to expel the air and prevent its further access, and it is therefore

manifest that in the case of unchaffed or unshredded fodder a great weight will best obtain these results.

The silo was left for a period of 23 weeks, or nearly six months. It was opened on the 29th of January of this year, in the presence of Colonel Badcock, C. B., Deputy Commissary-General. An attempt to open it at the top, by removing some of the sleepers, proved unsuccessful : the grass had solidified so compactly that it was found impossible to extract it, and even a pointed iron crowbar could not be driven into it. This corresponds with experiments made in America, of which it is recorded the fodder had to be dragged out by hooks harnessed to horses. One of the built-up openings in the wall was therefore broken down, and the ensilage cut into with an American hay knife. The whole of the sleepers and shot were subsequently removed, when no further difficulty was experienced in issuing out ensilage, which came away in sheets. The uppermost layers were of a darker hue and drier than that which was found below. The colour of the grass would be correctly described as a rusty brown, although portions of it were of a yellowish green shade. This latter colour was met with in the interior of the silo, where also the grass was much the most moist, so much so that it would be described as reeking with its own juices.

The grass had a strong, acid and vinous smell, which it retained for fully 48 hours after removal from the silo, it was distinctly noticeable passing carts carrying the ensilage to the cattle lines, and any where within 50 yards of the opened silo ; it more resembled the smell of an empty beer hogshead than anything else. Considerable fermentation had evidently taken place, and a thermometer thrust down into the grass itself registered 110° Fahr.

When opening the silo the precaution was taken of letting down a lighted candle to the surface before any one was permitted to descend, but no effect on the light was visible, and no inconvenience whatever was experienced either by Eu-

ropeans or natives who remained for hours in the pit.

The following explanation, why fodder ensilaged keeps, and why it becomes acid, is offered by Mr. Barras, Secretary to the Central Agricultural Society of France. He writes:— “Fermentation, decay, rot, and fire, are all identical. The only difference is in the degree of speed with which the combustion goes on. They, all alike, depend on the presence of oxygen, and cease when this active agent is removed. The process of combustion, whether slow or rapid, consumes oxygen and gives out carbonic acid gas. The fermentation consumes the small amount of oxygen which is contained in the mass of ensilage, and liberates an amount of carbonic acid gas which takes the place of the oxygen. The fermentation in its incipient stage is arrested for want of oxygen; none can get at it from the top, for the compression which is constantly going on is all the time forcing the gases out, and when there is ever so slight a flow out none can possibly flow in. Then as carbonic acid gas is heavier than the atmosphere, the sides and bottom of the silo being tight, and as the carbonic acid cannot leak out, the air cannot get down into the space occupied by the carbonic acid any more than air can get into a jug filled with water or any other heavy liquid, until the water or other liquid is poured or leaks out. The ensilage is thus immersed in a bath of carbonic acid gas. Further fermentation under such circumstances is an impossibility.”

The silo, when originally filled in, measured 11 feet in depth, and in six months it had sunk nearly half. In American experiments, chaffed fodder subsided usually one-fourth; but where coarse rank grasses are cast in as they come, and no attempt made to lay them out regularly and evenly, or to tread them down with men or bullocks, (which, however, might easily be done,) no doubt the subsidence will always be found to be nearer one-half, than one-fourth.

The first issue of the ensilage to the Government siege

train bullocks at Allahabad, was made on the 30th January, and continued for a week. In all 361½ maunds were issued, at the rate of 20lbs. per bullock per diem. These bullocks are bred on the Government farm at Hissar, and such a thing as "ensilage" has never been placed before them. They ate it readily. The most of it was put through the chaff-cutter and given as a feed morning and evening with the ration of gram, but the bullocks as readily devoured it when given in the state in which it came "out of the silo. Mules took to it less readily, whilst horses required a considerable degree of coaxing to be got to eat it at all." Milk cows, and calves went at it greedily the instant it was thrown down before them: goats would not look at it.

Through the cordial co-operation of Major Elliott the Deputy Assistant Commissary-General of Transport, the experiments in feeding were fully and satisfactorily carried out, and it has now been practically demonstrated that common grasses ensilaged, form an agreeable and valuable change of diet to the Government cattle during the months when only dry fodder is procurable; which at Allahabad is for a period of about eight months in the year.

The total outturn of the silo was about 365 maunds, which gives a little over 18lbs. to the cubic foot, an average far below the 45 to 50 lbs. to the cubic foot, which, it is reported, was the density of silos in America, in which however the fodder had been finely chaffed as well as trodden in. This would perhaps account for the disparity.

This experiment is of great value, because by it is demonstrated, for the first time in India, the entire feasibility of preserving the rank vegetation, which arises over all lands with the first burst of the monsoon, for future use many months afterwards when the rains are over and a tropical sun has once more burnt up the land.

In order to compare the methods of preserving grass during the monsoon season by ensilage and by converting it into

hay, at the same time as the silo was filled a large quantity of the same grass was cut in the Fort for hay. Great difficulties were experienced in getting it sufficiently dried for stacking. A large quantity was destroyed by rain, and of that stacked (about 430 maunds) from $\frac{1}{4}$ ths to $\frac{1}{2}$ ths of the weight of the green grass had evaporated in the process. At this season the grasses contain an enormous percentage of water which is not lost by the process of ensilage, but which, of course in the process of conversion into hay, wholly disappears. This stack of hay was cut into and issued during December; much of it was black and mouldy; and the whole of it was very inferior quality hay, and was scarcely eatable until mixed with sweet new hay, made of grasses fully matured, and reaped in the months of October and November, the experiment of making hay during the monsoon was also tried at Allahabad in 1882, and was not successful, viewed as to expense and quality. Probably throughout the North-West, two crops of grass can be got off most land watered only by the monsoon rains, provided the first crop can be preserved, and this the system of ensilage secures. By simply casting into silos, thousands of maunds of succulent grasses may be annually secured throughout these provinces, as provision for the times of terrible fodder scarcity, which overtake the village cattle with each recurring hot weather. Before the result of the experiment became known, every native with whom I spoke on the subject was confident that the rank immatured jungle grasses sprung up by the first rains would never keep good for six months. Unquestionably great difficulty, and expense and loss of weight, is experienced in making hay of such, but in casting it in and pressing it in a silo everything is simple and inexpensive, and the result highly gratifying.

The need for securing grass, when it is abundant, may be estimated by the fact that at the present time, at Allahabad, a half-maund bundle of chiefly roots of grasses grubbed up with the "khurpa," in the "kachar" land of the Ganges,

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or from neighbouring "jheels" (and therefore unwholesome and likely to cause colic, anthrax, &c. to the cattle eating it), fetches four annas, whilst good hay commands Re. 1 a maund. Allowing fairly for all expenses, any quantity of green grass could be "ensilaged" at Allahabad during the monsoon season at a cost of from 2 to 3 annas a maund. The nutritive value of ensilage lying midway between that of green grass and hay, its present market-rate would be 12 annas a maund.

In a future paper we hope to give an account of a silo that has been constructed in an open field, merely by digging a pit, and which, at the time of writing, has been shut up for upwards of half a year.

ALLAHABAD ; } G. WINGATE, CAPTAIN,
18th February 1884. } *On Special Duty.*

**REPORT OF THE JURY ON BRIGADIER GENERAL
WILKINSON'S SILOS.**

Calcutta International Exhibition.

CLASS I, SECTION 140.

(Published with the sanction of the Executive Committee.)

WE have now the honor of submitting our report on Brigadier General Wilkinson's very interesting and valuable exhibit of Silos. These were of two distinct forms, one being adapted to the means of ordinary Ryots, and the other a permanent structure such as would be used by the Commissariat Department, by Planters, Zemindars, and substantial farmers.

The first was of a circular form the walls being made of kneaded clay, the "Bhit" of which native houses are frequently made; no good clay was available on the site, that which was used had not the tenacity and consistency of the proper material, and time did not admit of chopped straw and "Bhusa" being kneaded with the clay as is usually done by

natives building structures of similar material, in consequence the walls cracked considerably in various places which had a bad effect on the ensilage to which the air thus got access.

The clay, or "kutcha" Silo was shaped like an inverted cone, so as to ensure lateral pressure, the dimensions were 7 feet of wall above the surface, 6 feet sunk below the ground level, diameter at the ground level 8 feet, and at the bottom 6 feet, walls 2 feet thick. The cone shape is, however, a form not to be recommended, it causes greater friction, adds to the strain on the walls, and is consequently more expensive, and any compensating advantage is doubtful.

The masonry Silo was of very solid construction, being made of burnt bricks and mortar, and the inside cemented. It was 20 feet in length, 10 feet in breadth, and 10 feet in depth, and was divided into two equal portions by a cross wall of masonry, one half being left empty to show the construction; one half of the masonry Silo, and the "kutcha" Silo, were loaded simultaneously on the 28th December, with a very coarse grass, which was purchased on the spot by weight, and which the vendors saturated with water before bringing to the scales. One hundred maunds of this grass was loaded into each Silo, layers of mats spread on the surface and three feet of earth filled in on top, equalling about 300 lbs to the square foot, which completed the loading operation.

Upright gas pipes were let into the centre of both Silos, for convenience in taking the temperature, the readings averaged about 91° in the kutcha and 85° in the masonry Silo, and varied with the temperature in the open air, without, however, being the same. As far as the Jury are aware this is a new and very useful addition to a Silo, as the readings would indicate when the fermentation was approaching a destructive stage. The difference of the temperature in the two Silos shewed that they were meeting different degrees of success. Unfortunately a daily record of the thermometer was not kept.

The Silos were opened on the 12th April having been 3 and half months, or 105 days, closed. The ensilage from the masonry Silo was of a very fine quality, of a bright yellow-green shade, juicy and fresh looking, perfectly good, and sound to the very top and sides : sections cut out with a hay-knife came away in solid blocks, yet not too hard, showing that the pressure had been well calculated. The contents of the clay or "kutcha" Silo was not so well preserved, as already stated the wall cracked in several places, which giving admission to air prolonged the fermentation wherever it penetrated, into the putrefactive stage; the larger quantity of the ensilage, was however well preserved, though the color was somewhat darker than that from the brick Silo and the quality was not so good, still it can be pronounced a success as it shows clearly that under more advantageous conditions, which could always be ensured, such simple and inexpensive Silos would answer perfectly for preserving fodder.

The question of ensilage has of late attracted so much attention, both in America and in Europe, and so much has been written on the subject, that it would be traversing old ground if the jury were here to enter upon the advantages secured to farmers by its use. Still they cannot refrain from pointing out, that in India the want of means of preserving the superabundance of fodder to be had in the rainy season, against the yearly recurring dearth of the hot weather, has long been felt.

The hot season in India, is to the Ryot what the winter is to the British Farmer in respect of fodder for cattle, with the difference that the high price of milk, meat, stock and produce allows of the farmer's growing roots and hay for winter consumption, whereas in India the conditions under which farming is conducted do not admit of a similar practice, and only straw and bhusa are available for fodder purposes. In the rains there is abundance of grazing and to spare, as then the grass grows luxuriantly; up to the end of the cold

weather," when the thrashing is done by means of cattle "treading out the corn," they remain in good condition,—in fact the Ryots frequently look to the thrashing to revive worn out and over-worked cattle—with the end of the thrashing the yearly scarcity commences, and the cattle are kept alive merely on the scanty grazing the parched lands and the edges of roads, &c. afford. Any year in which the rains fail, even slightly, cattle die in numbers. This of course applies to Ryots, cattle used only for the plough, and to cows, and not to cart bullocks, as these having work all the year round, are fed to some extent, generally with bhusa, or with chopped straw sometimes mixed with water and a little oil cake broken in with it, but even cart bullocks suffer from the scarcity of green food, and as a rule when they are not employed, they too are not fed.

In addition to the grass of the rains, which the weather will not permit of being turned into hay, there is also at other seasons an abundance of fodder which could be preserved by means of a Silo, but which can now only partially be utilised, e. g., when the sugarcane crop is cut, the upper leaves are eaten by cattle, but cannot well be preserved, and in some parts of the country this has given rise to a custom that any passer by can join in the work of stripping the cane taking all the leaves he has so stripped for the use of his own cattle. Again the vine of the "Aluah" or sweet potatoe, is much relished by buffaloes and adds greatly to their yield of milk, but can only be used while it remains fresh so many Ryots have a wasteful custom of merely taking up as much of the roots as they require for immediate consumption, leaving the ground encumbered with a crop long after the necessity ceases. Other examples could be given.

The Jury are therefore of opinion that General Wilkinson has rendered a public service in thus demonstrating the ease and certainty with which fodder can be preserved, and in thus pointing out to the Ryot, how at a small expense the yearly

recurring dearth of cattle fodder can be ensured against, and met by a method ready to every man's hand.

Under these circumstances the Jury feel no hesitation in strongly recommending to the consideration of the Executive Committee, the propriety of converting the first class certificate and Silver Medal awarded to Brigadier General Wilkinson, into a first class certificate and Gold Medal.

(Sd.) W. H. COGSWELL,
,, R. BLECHYNDEN, Jr.

THE EARLY AMBER SORGHUM.

NOTE BY RICHARD BLECHYNDEN, JUNIOR, DEPUTY SECRETARY.

THIS note purports merely to place upon record the result of certain trials made during the year, with seed of the Early Amber Sorghum distributed by the Society.

The Early Amber Sorghum has of late attracted a considerable amount of attention in America, and a large number of experiments have been conducted by the Agricultural Department of Washington, the results of which are given in a series of admirable tables and diagrams in the Directors' Report for the year which record simultaneous trials made with many varieties of Sorghum; the best results were given by the Early Amber which is, as stated in the Proceedings of the Board of Revenue, Madras, No. 1962, dated 8th August 1882, "a variety which originated in Indiana State, U. S. A., in 1860, from a plant which appeared in a crop of Chinese Sorghum, the seed of this plant was sown, and the produce again sown, which being repeated for several years, a large quantity of the seed has been produced. Through the Agency of the U. S. Agricultural Department, the seed has been widely distributed over the various states, more specially in Minnesota where it has thriven well." The farmers of Minnesota, however, with that practical application of knowledge which is so marked in America, acting on the known fact that Sorghums thrive in

southerly latitudes, sent a quantity of selected seed further south, and have finally become possessed of a much improved variety which takes its name "The Minnesota Early Amber Cane" from its quick growth and from the color of the juice it yields.

The trials made in the Saidápet Government Farm, Madras, reviewed in the proceedings mentioned above, are thus summed up :—

"This crop appears to have become thoroughly established in Saidápet, and its distribution over the Presidency can thus readily be secured. Under fairly good condition of soil and climate, such as are generally secured for the ordinary sugar-cane crop, this new variety of Sorghum cannot fail in being a very heavy producer. The experiments made at Saidápet would seem to show that the best time for cutting the plant for crushing, is when the seed begins to harden; thus, the seed is secured as well as the canes, and while the juice of the cane may be converted into jaggery or sugar the cane refuse is well adapted as fodder for stock; thus the crop becomes a grain, sugar, and fodder producer."

In April last (1883) Captain Pogson wrote :—

Thanks for your last letter, and in reply I have to advise you of the despatch by this day's Banghy Post, bearing, of a tin canister containing 18 ounces of "Early Amber Sugar-cane" seed, I have in it forwarded the paper of directions, but did not receive the sample of white sugar made from this cane.

The plant may be a connecting link between the Sugar-cane and the Sorghum, or it may be a cross between the two. The seeds differ in form from those of the black Sorghum, and a photograph of a group of the plants shows long joints like those of the "imphee." The Kowar Jai Narain Singh reports, that the seeds I sent him last month of the Early Amber Sugar-cane, have germinated freely, and the seedlings were making vigorous growth. My surviving plants have

made good growth since the warm weather set in, I put down more seed yesterday evening.

The best plan to utilise the seed will be, I think, to divide it into 72 papers of $\frac{1}{4}$ of an ounce each, and to send some to the Northern States of the Punjab, *i. e.* Gurdaspore, Hoshiarpore, Wuzeerabad, Jhelum, Rawul Pindee and Abbottabad, Mr. Peppe, of Goruckpore, the Secretary Bijnor Agricultural Society, all or any Tea Planters in Dehra Doon, who may be members of the Agricultural and Horticultural Society. The Hazareebagh and Chota Nagpore Tea Planters should try it. Then for Bengal proper, two sowings should be tried, the first at once and the second when the rains are over. This experiment would determine the proper time for sowing in Bengal. My idea is that the proper time will correspond with the time for sowing imported maize seed, for Bengal. But as the Jowar (Daodhan of Bengal) or Holcus Sorghum grows well in Bengal during the rains, the Early Amber Sugar-cane may do the same. Each paper of seed should be accompanied with a printed copy of the paper of direction."

The seeds sent by Captain Pogson were distributed as far as could be on the lines he laid down, one or two reports on this seed are here given.

Mr. Leadbeater's, of Rauikhet, report arrived too late for the last proceedings,* writing on the 16th October, he says:— "The Sorghum you were kind enough to send me for trial was put down about the end of May, and the canes were cut to-day. They are small and not very full, but I will make another sowing in February. This climate is not suitable for Sugar-cane."

The Kowar Jai Narain Singh in a letter, dated Didwary, 26th October, kindly forwarded by Captain Pogson, says:—"I have tasted the Rattoon canes of Early Amber Sorghum, and find the juice as sweet as that of the first crop, and in no way acid. During the course of next week I intend pressing this Rattoon crop, and will let you know the yield." I

* Proceedings of 26th September 1883.

am glad to inform you that I have been able to obtain more than a pound of seed from the Ratoon canes."

Some seed, apparently from the same batch as that sent to the Society, was sent in March to the Kowar Jai Narain Singh by Captain Pogson, in August Captain Pogson writes*—

"On Monday I purpose despatching per Bangy, Bearing, to your address, a square quart bottle filled with syrup or "*Rab*," made from the expressed juice of the "Early Amber Sugar-cane," and if the parcel reaches safely, I shall be much obliged by your presenting the same to the Council of the Agricultural Horticultural Society for their consideration and valuation.

On the 20th of March last, I sent the Kowar Jai Narain Singh, of Didwary, in the Meerut district, four ounces of "Early Amber Sugar-cane seed," which was sown within the month. The seeds germinated freely and the seedlings grew vigorously. After the 15th July the canes were cut, passed through a Behea Sugar Mill, and the juice made into syrup or "*Rab*." On the 4th August, I received a parcel containing about four seers of syrup put up in bottles.

The result of this sowing is remarkable for the plant has yielded its saccharine product within 3½ months.

The canes were 6½ feet in height when cut, and $\frac{3}{4}$ ths of an inch in diameter, and the joints were nine inches in length. The seed had formed, but the birds of the locality ate them up, so no seed was saved. The Ratoon crop will be ready in October or November, and if it yields more syrup, the success will be still more remarkable.

The Early Amber Sugar-cane seed in question was obtained by me from Mr. Gregory, Massachusetts, and the greater portion sent to the Society and distributed.

The want of rain and great heat seems to have retarded the growth of the plants, which should have reached nine feet in height. However, it is satisfactory to know, that the proper time for the first sowing of this Sugar Sorghum seed

* Proceedings for August 1883.

in the Meerut District is in March, and perhaps August and September may be the season for second sowing.

The second crop should ripen by the middle of December, and should be better grown as the cold is conducive to the production of saccharine juice.

I hope you will be able to save the seed of the plants now in flower in the Society's Garden, as such acclimatized seed will be of considerable value for sowing in all September."

The following analysis and able report was kindly given by Mr. H. B. H. Turner of the Cossipore Sugar Refinery :—

"Analysis of the Sorghum Rab from Mussoorie.

Cane Sugar	...	42·00
Glucose	...	27·54
Moisture	...	18·94
Insoluble	...	1·50
Extractive	...	4·50
Ash	...	1·64
Salts	...	3·88
	—	
	100	
	—	

It is thus valueless for sugar refining. From this Analysis, I judge that injury has been done to the material by allowing it to ferment, whether before boiling, or subsequently, I cannot say, but it is now deteriorating day by day, and it is quite possible that when first made it was in better order, at present it is very acid.

The worst sample of Buxar Goor I analysed, gave the following :—

Cane Sugar	...	68·50
Glucose	...	10·80
Moisture	...	7·85
Insoluble	...	2·78
Extractive	...	4·92
Ash	...	1·78
Salts	...	3·37

100 Sells @ Rs. 3 to Rs. 3-8.

This also I considered unprofitable to refine, owing to difficulty in dealing with the large bulk of molasses.

Some native molasses which are sold for tobacco curing and spirit making, returned—

Cane Sugar ... 28·50

Glucose ... 17·45

This sells at about Re. 1-12 to Rs. 2-8, but is quite free from acidity, and is therefore more valuable than the Sorghum Rab.

If a sample quite free from acidity (which can readily be tested by Litmus paper) be sent me, I shall be very glad to analyse it."

In reference to the seed of this Sorghum, now available for distribution, Captain Pogson suggests that some be sent to the "Kowar" Jai Narain Singh, of Didwary, Moradnugger, to be cultivated as a Rubbee crop. Captain Pogson will himself give the Kowar the requisite instructions for its cultivation, and is confident that with irrigation the canes will be ready for the Mill by the middle of November.

The following is an extract of a letter from the Kowar Jai Narain Singh to Captain F. Pogson :—

"I am not in a position just now to say with any degree of certainty whether the Early Amber Sugar-cane will be remunerative enough to induce the people to cultivate it largely, because in the first place the quantity sown by me was too small, and no estimate of its probable produce could fairly be formed, besides I find, that perhaps owing to the hot season, the "Rab" I had put in pots, as yet shows no signs of crystallizing, without which no Sugar can be made. "Rab" made from country Sugar-cane crystallizes in about a fortnight into hard and sand like grains.

The roots of the newly cut Early Amber Sugar-cane have shot forth, and are now about two feet high. I hope they will ripen along with the country Sugar-cane when I hope to test its produce fairly. This season has been unusually severe.

No rain from the 1st of July last. All the kharif crops are parched and dried, besides the long drought has produced a kind of worm that has eaten up all the growing shoots of all kinds of cereals."

Mr. Helps of Rangli-Rangliot writing on the 17th and 25th September says*—that the Early Amber cane sown in May and June is from 5 to 7 feet high, but not thicker than his little finger, it is in full flower, and has much the appearance of the "Jowar" grown in the Punjab. Mr. Helps goes on to say:—

"I shall be very glad to give the "Sorghum" seed another trial, and I think if sown a month earlier will be a greater success than what I put down this year.

The "Sorghum" seed you sent me last May I put out at two different times; end of May and beginning of June, the success of the first sowing inducing me to try the second, but, most unfortunately, a day or two after the second sowing very heavy rain came on, and washed nearly all the seed away, besides doing a deal of damage to the young plants I had, up from the first sowing, the plants were only a few inches high and delicate, but by sowing a month earlier I think they would be strong enough to resist any rain. I moreover, think that it is the proper season of year for sowing the seed here, judging from the way the first came up. My difficulty will be in getting the cane pressed for there are no Mills in these parts, but I will do my best, and if I can manage it will get a carpenter to make me a rough one just to try and make "Goor" and "Rab" as you wish, but I should like to have a few instructions sent me as to how it is done as I have no idea myself. I noticed the cane contained a deal of saccharine matter. Elevation at which grown is, I think, about 4,500 to 4,600 feet.

This is a very good elevation for potatoes, and they grow well here: so if you have any good seed I would not mind trying a few maunds if you could send them up. I would

send you part of the crop, if successful."

Herbert Finch, Esq., Mewnah Estate, Shahjehanpore, in a letter, dated 17th September, says:—

"The Early Amber Sugar-cane seed you sent me was sown on the 15th July, and is now seven feet high and in seed. The quantity is too small to admit of any practical experiment as to its value for producing sugar, but the rapidity of its growth would alone make it of value as an intermediate fodder crop for elephants and cattle. Experiments made with very small quantities of seed are practically useless. It would take some four maunds of cane, to make a boiling the result of which could be depended on. If you will send me four or five pounds of the seed, I will sow it in March next."

A few lbs. of seed have been sent to Mr. Finch for trial.

From Kowar Jai Narain Singh, Didwary, Moradnugger, 23rd September:—

"The proper season for sowing the Early Amber Sugar-cane appears to be during the months of May and June, for then the crop would come up along with the country Sugar-cane in November and December, which is the proper time for pressing the juice. I will, however, sow a small plot of ground just now to see if the plants come to maturity in December or January, in which case a second crop can be obtained.

Captain J. F. Pogson supplied me with the seed I sowed in March last, and the canes became fit for pressing in June, which was done by means of a "*Bekeia*" Sugar-cane Mill, but as the weather was extremely hot, the juice did not crystallize and produce saccharine matter sufficient to form into sugar.

As you have now been good enough to supply me with a large quantity of seed, I will do my best to give it the fullest trial possible, and communicate to you in detail the result of my success or otherwise."

Captain Pogson, writing on this subject under date 6th September, says:—

"In my letter, I asked you to send me a sample of the

"Broom Corn," in order that I might ascertain what it really was. I see our common "Bajra," is in America called "Pearl Millet." The "Doora," turns out to be a new or unknown variety of "Jowar," (*Holcus Sorghum,*) and I strongly suspect the "Early Amber Sugar-cane" is the "Impee," or Chinese Sugar Sorghum improved by cultivation.

I think it would be a good plan for the Council of the Society to sanction an indent being made on China for all varieties of Sugar producing Sorghums. Johnston says:— "In China under the name of "Sugar-cane of the North," a species of Sorghum is cultivated for the extraction of sugar. This plant was introduced into France by M. Vilmorin, who states from his experiments, that it is capable of yielding, on an average, from an acre of land 26,000 pounds of juice, containing from 10 to 13 per cent. of sugar, and that this is more than the average yield of the sugar beet. It is alleged, however, that the plant is adapted to only a few parts of the South of France."

I believe the far-famed Sugar-candy of China, is made from the sugar obtained from this variety of Sugar Sorghum, which may be a very superior variety of "Impee."

The Chinese are not given to parting with these best varieties of seeds at once, and I dare say the "Impee," obtained over 40 years ago, was a common kind. The mere fact of the true Sugar Sorghum, coming from the North of China, shows that it is an inland plant, grown in a cool or cold climate. Our knowledge on the subject is very scanty, and should be increased, and it would be a great point gained if the Chinese method of making Sorghum Sugar and Sugar-candy was ascertained.

At the Cawnpore Farm, the "Early Amber Cane," gave an "intensely acid juice" and pot extract or "Goor," to correspond."

The Secretary in reply to Captain Pogson, drew his attention to the proceedings of the Board of Revenue, Madras, al-

ready quoted; Captain Pogson's suggestion was approved of, and the Secretary was instructed to put himself in communication on the subject with any correspondents the Society may have in China.

A large sample Cake of Goor, manufactured from this Sorghum, was kindly sent by Major Pitcher, of the Department of Agriculture and Commerce, N.-W. Provinces and Oudh.

Major Pitcher writes* that the Goor was made without the addition of lime, in the ordinary way, that 18 to 20 maunds had been made at the Cawnpore Government Farm, and that the Sorghum juice can now be manipulated there with almost the same ease as that of Sugar-cane. He mentions that the Sorghum Goor submitted last year for an opinion and on which an unfavourable report had been given, to the effect that it would not keep, is still perfectly good.

Mr. H. B. H. Turner has kindly analysed a portion of the Cake with the following result :—

"The Sorghum Goor has been analysed at Cossipore, and the result shows—

Cane Sugar	...	...	...	55·
Glucose	...	...	...	21·60
Moisture	...	...	...	9·72
Insoluble	...	...	...	·30
Extractive	...	...	...	9·12
Ash	...	...	...	1·51
Salts	...	...	...	2·75
				<hr/>
				100·00
				<hr/>
=Obtainable Cane Sugar	...	...	...	19·65

This sample like the previous one is valueless to a refiner. Judging from the large amount of Glucose, I am of opinion, that this Goor has been spoilt by the juice being kept too

* Proceedings for October 1883.

long before boiling, or it has become fermented by having been run into sour vessels when extracted and before being boiled.

The large quantity of extractive matter too, renders it of less commercial value, this matter should have been removed from the juice by filtration before boiling."

Half the Cake of Goor sent by Major Pitcher, was placed as an exhibit in the Society's shed in the International Exhibition just over.

In July 1883, 160 lbs. of fresh seed arrived, imported from America direct, 100 lbs. to the order of the Government of Bengal, and 60 lbs. for trial by the Society's own Members, this has been distributed in sufficient quantities to have a practical and satisfactory trial made by each recipient. The result will in due course appear in the Society's Proceedings.

The trials as yet made have been upon too small a scale to admit of any general conclusion being drawn from them, but looking to what has been done in America it would indicate that the fault lies in the process of manufacture, as the ordinary Native Indian Process has been used, *viz.*, boiling in a single open pan directly over the fire. As has frequently been noticed, the construction of the pan is very faulty, and it is well known that even Sugar-cane juice loses a considerable percentage of crystallisable sugar under the process. The juice of the Sorghum presents greater difficulties to the maker, though the knack of manipulation is acquired with experience, as noted in Major Pitcher's letter quoted above.

If nothing else has been gained, an extremely quick growing fodder plant, much relished by all stock, has been introduced into India, which would be extremely well suited for ensilage on account of its rapid growth.

Some extracts, from American Agricultural papers, on the subject may be useful.

The following remarks are from an address made by Dr. Collier, at Washington, in November 1883, in which he

gives many extracts, from the Press of different States, on the subject :—

“General Coleman, President, Mississippi Valley Cane Grower’s Association, in his opening address at the last meeting of the Association says :—“ I have no hesitation in putting myself on the record at this time, as saying that within the next twenty-five years this country will not only make all the sugar that it still consumes, and of the very best quality, but it will export it in large quantities. I know that some wise-acres will deride these predictions, but I make them, because no other plant possesses so many merits and advantages as a sugar producing plant. It adapts itself to our soil and climate, from the British possessions on the north, to the Gulf of Mexico on the south, and from the Atlantic to the Pacific Oceans. Dr. E. L. Sturtevant, the Director of the New York Experiment Station, in a recent address said :— “ Some years ago I went to Washington as an opponent of the Sorghum interest. I went to the chemist’s room and told him I wanted to see the whole process. I did so, and instead of coming away an opponent of Sorghum, I became converted to its future usefulness. It has now passed the experimental stage, and become a settled fact.”

In a letter to the Cane Grower’s Association of the Mississippi Valley, Henry B. Blackwell, Treasurer and Managing Director of the Maine Beet Sugar Company, says :—“ I have recently become convinced by the experiments of Professor Collier, of the United States Department of Agriculture, Washington D. C. that the juice of well matured Sorghum is equal to that of the Sugar-cane. This summer, I raised an experimental crop of ‘Early Amber’ and “white Liberian” from seed obtained at Washington, in my Garden here in Boston, Mass. In the last week in October I cut the last cane, fully matured and still uninjured by the frost. The juice gauged 11° Beaume, when clarified, and proved so fine

that I had it analysed by Mr. Sharpless, State Assayer, 114, State Street, Boston, with the following result :—

	Per cent.
Water ...	78·18
Cane Sugar ...	18·00
Inverted Sugar	2·09
Ash ...	·89
Gum, &c. ...	·84
	<hr/>
	100·00
	<hr/>

This being fully equal to average West India cane juice, and I made a few pounds of sugar over the open fire, without the use of bone-black or of any chemical except lime."

The address is published *in extenso* in the *Sugar-cane* for March ; though the editor of that journal does not attach any importance to the facts produced, but is inclined to think that the Americans are deluding themselves.

*Description of Early Amber Cane.**

Glumes black, culm erect, Head slender, erect ; branches appressed, pointed, 9 to 10 inches long. Glumes, large, smooth, shining, acute at both ends, concealing the seed, or open, flattened on both sides.

Seeds, long, obtuse, light colored ; hilum large, with a prominence in the centre.

Synon. Early Golden, Golden Sirup.

The percentage of juice extracted from the stripped stalks gradually increases up to the eleventh stage, then gradually diminishes until the close of the season.

The specific gravity of the juice, the percentage of sucrose, the percentage of solids not sugar, and the exponent, regularly increase until the close of the season ; and the percentage of glucose in the juice as steadily decreases from the first.

It may be here noticed, that the sucrose increases in the juice much more rapidly, then do the solids not sugar; and this fact taken together with the steady decrease of glucose, is the explanation of the equally steady increase, of the exponent which represents the comparative purity of the juices.

It is stated in the discussion of the table of specific gravities that the proper stage in the development of Sorghum at which to begin the manufacture of sugar, is when the juice has the specific gravity of 1·066 corresponding with the exponent of 70.

We further see that this specific gravity (1·066) and exponent (70·15) are attained when the * * * seed of the plant is quite fully developed and hard. By these three indications every cane grower can judge for himself as to the proper time to work up his Sorghum crop, in order that he may obtain satisfactory results.

The amount of juice obtained seldom falls below 60 per cent. of the weight of the stripped stalks.

The success reported by our correspondents as attending the growth of Sorghum in Louisiana and Texas, and the demonstration that two crops a year can readily be grown and worked up before frost, in all the extreme Southern States, warrants the belief that the Sugar Planters of that region will ere long find it to their advantage to substitute, in part if not altogether, the cultivation of Sorghum, for that of the ribbon cane.

Such a change is made the more probable by the fact, that from one-sixth to one-third of the sugar lands of the Southern States has to be given up annually to the production of seed cane, if intended for the production of Sugar-cane, whereas the whole could be devoted to Sorghum, which produces its own seed, and yields a full crop of sugar besides; and further, that ribbon cane, from the time required for ripening, is frequently overtaken by frosts, whereas two crops of Sorghum can be grown there during the same time with-

out danger of being so overtaken.

The repeated experimental examinations, made by Dr. Collier in the laboratory of the department, furnish satisfactory evidence, that Sorghum cane is the equal of Sugar-cane in saccharine matter, yields as much per ton, is more easily cultivated, and can always be planted after frosts have ended in the spring, and before they begin again in the fall; and the Louisiana planters, who have not been wanting in intelligence to detect, and in readiness to adopt methods that are useful, will be quite sure, we think, to profit by the opportunity that Sorghum affords:—From Report of the Commissioner of Agriculture, Washington, for the year 1880.

RICE HUSKING MACHINE.

A large number of applications having been received for information regarding this machine, due no doubt to the attention it excited from natives and others, at the Exhibition, where one was kept at work daily, it has been thought advisable to transfer the following from the proceedings for June 1883:—

“In the proceedings of the 27th September 1882, the following allusion was made to a Rice Husking Machine:—“A model as used in the West Indies by the Chinese, has been constructed by the order of Mr. W. H. Cogswell from a rough sketch kindly furnished by Mr. H. A. Firth, and it has been determined to give the same a practical trial shortly with a full report thereon so that its usefulness may be generally made known.”

“The model is apparently of the full size and stands 2 ft. 6 in. high, it consists of an upright shaft, or column, of hard wood, the upper face of which is cut into deep grooves radiating from the centre, where a strong pin is fixed; the grooves are quarter of an inch in breadth and one-eighth in depth, a heavy disc of hard wood, similarly grooved and of the same

diameter is made to revolve rapidly, the central pin being the axis; paddy is poured into a receptacle on the top of the revolving disc and falls out, in form of rice and husk, into a circular tray affixed to the shaft, grain is then separated from the chaff either with a winnowing machine, or by the very effectual native hand process."

"In making such a machine for use in India the upright shaft might be dispensed with, and a heavy block of wood substituted, so that the top of the revolving disc would be within easy reach of the manipulator when seated in the only position a native of India seems able to work in. This would also reduce the price somewhat as the tray too could thus be dispensed with, and the Rice would be allowed to fall directly on to the floor. In whichever way it may be made, the machine is so simple that any common village carpenter could make one at a very trifling cost."

"The result of a trial against the "Dheki" and up-country "Ukhli" is given below. It may be proper to note here that the Dheki has one advantage over the Rice Husker, *viz.* that the rice, after being husked and winnowed, can be re-pounded, and the brown marks or skin, which will always be found on rice, thus removed, this process whitens the grain and brightens it considerably, making a difference of some three or four seers in the rupee in the marketable value. It is, however, to be remarked that should this be considered necessary, the rice can be put under the Dheki, after being husked in the machine at a great saving of time and cost. It need scarcely be said that the whitening process involves a loss in weight."

"The machine has a marked advantage over the primitive native methods when "aroothah" or unboiled paddy is dealt with, as the difference in breakage as noted below, is then very appreciable, and when it is remembered that a great number of up-country natives object to Usna Rice (made from boiled paddy) its advantage over the Dheki, and "Ukhli" in this one respect alone should make it sought after, leaving out of

consideration its other advantages which a glance at the table given below will show. It is of course for consumers to decide which rice they prefer, but arooah (unboiled paddy) rice would seem a somewhat more cleanly article than "usna" (boiled paddy) boiled with water, to the quality of which, the majority of consumers are as a rule profoundly indifferent."

RESULTS OF TRIALS.

	BOILED PADDY, "USNA."						UNBOILED PADDY, "AROOAH."					
	No. of men.			Time (minutes.)			No. of men.			Time (minutes.)		
Rice Husker...	Sr.	Sr.	Sr.	Waste.	% of Broken Rice.	Rice.	Paddy.	Rice.	Paddy.	Husk.	Waste.	% of Broken Rice.
" Dheki" ...	1	17	5	3.12	1.1	3	18 $\frac{1}{2}$	1	17	5	3.10	1.3 $\frac{1}{2}$
" Ukhli" ...	2	38	6	3.10	1.2	4	81 $\frac{1}{2}$	2	24	5	3.6	1.5
	2	22	5	3.8	1.2	6	81 $\frac{1}{2}$	2	25	5	3.10	1.2

In the above table the column "broken" includes all rice however slightly broken, or even chipped, hence the very high percentage.

The annexed working drawings were prepared to meet the many applications made for drawings, or models, of the machine.

Plate No. I.

Fig. 1, Elevation.

„ 2, Plan.

Fig. 1.

- A. Handle, by pulling and pushing which, the operator causes the upper part of the mill to revolve, a. is the attachment.
- B. Hopper, made of two pieces of wood.
- C. Band of iron holding hopper together.
- D. Band of iron similar to C. holding E.
- E. The mill proper made of four or more pieces of hard wood, cut so that the teeth do not fall across grain.
- F. Lower portion of mill similar to E. f. iron band holding F. together.
- G. Projecting arm, holding H.
- H. Board which revolves with upper part of mill, collects the husked grain and drops it through hole in tray (J.) in to receiver (N.)
- J. Tray, circular, with high rim to receive grain.
- K. Iron band, holding stand, or column (L.)
- L. Stand, or shaft, or column, made of two or more pieces of wood.
- M. M. legs, to give stability to machine.
- N. Receiver for husked grain.

Plate II.

Fig. 1, Elevation Hopper.

A. Receptacle for handle.

B. Attachment to mill "stone," by pegs.

Fig. 2, Section of Hopper.

A. } Same as in Fig. 1.
B. }

Fig. 3, Receptacle for handle.

This is driven through Hopper and joins the two pieces of which that is made, it has a hole in the centre through which the upright, round which the mill revolves, passes. (Plate II, Fig. 9 A.)

Fig. 4, Lower bar, steadies motion of mill, the weight of which can also be regulated here by means of washers (Plate II. Fig. 9 B.); passes through lower part of hopper, as shown in Fig. 2, 4.

Fig. 5, Plan of hopper.

Fig. 9. Lower mill "stone."

A. Central shaft or pin, round which upper portion of mill revolves.

B. Washers.

These are of great importance, and a great deal depends on their proper adjustment, should the grain come out broken, add washers, if unhusked take off washers.

C. Disc of wood fitting loosely to bottom of upper "stone," so as to distribute the grain as it passes into the mill.

D. Attachment of mill to shaft.

Fig. 10, Plan of lower mill.

The attachment pegs are on the reverse, their position is here indicated.

Figs. 6, 7, 8, Plan, Section, Elevation of disc (Fig. 9 C.)
Plate III.

Figs. 1, 2, 3, Elevation, Section, Plan, of upper mill "stone."

This is made of four or more pieces of wood, the lower face is grooved as shown in Fig. 3, the upper part is joined to hopper, of which it forms a part, and which revolves with it. The grain passes through its centre before being operated on.

Fig. 4, Shaft or Column, made of two or more pieces of wood.

- A. Iron band.
- B. Body.
- C. Legs.

Fig. 5, Plan of No. 4, showing holes into which the attaching pegs of the lower mill "stone," fits.

PINE-APPLE.

Transferred from Proceedings of August 1883.

Though the Pine-apple is so thoroughly naturalized in Bengal and other parts of India, it is a native of South America and some of the West Indian Islands, where it is largely cultivated for export, particularly in the Bahamas, where all that is considered requisite for its successful cultivation is that the soil should be at least two feet in depth and capable of retaining moisture; a rough and ready way of testing this latter requisite, is to thrust a long knife into the ground in the dry season, and if earth adheres to the blade, the soil is considered suitable. The best pines are grown on a reddish clay rich with decayed vegetable matter, remains of shell fish, &c.

In the West Indies only two varieties are considered profitable for export, the Sugar loaf and the Scarlet. The former are planted somewhat closer together and have a longer time of life, about five years, while the Scarlet variety lives about three years, but the fruit comes to maturity a month or two earlier than those of the Sugar loaf. As all the fruit in a field do not ripen together they have to be gone over two or three times; the people employed in plucking them have to protect themselves with leather gloves and leggings from the sharp thorns with which the leaves are armed.

The cultivation is of the simplest, the undergrowth is cut down and rooted out, and the land grubbed up, the plants are then put down about 2 feet apart, in some places $2\frac{1}{2}$ feet, and $3\frac{1}{2}$ feet between the rows. In dry localities the spaces be-

tween rows might be utilised for water channels, as both quantity and quality of crop is injured by drought. Once planted the only cultivation necessary, is to keep the soil free of weeds.

Should it be contemplated sending the fruit to a distant market, they must be cut green, and in the West Indies where the fruit is exported, a large portion of the plants are taken as well. Ships are fitted up for the trade with tiers of shelves on which the fruit is packed, this arrangement allows of the passage of air, and the lowermost pines are not crushed and spoilt, as would otherwise be the case, with the weight of those above. The business is found very profitable in a good season, but ruinous in a bad; too much, or too little rain, armies of rats, land crabs, and bush fires, are a few of the ills the cultivator has to fear.

As regards growing the plant for fibre only, the fruit should not be allowed to form and the leaves will then grow larger and broader. The well known pine-apple cloth is made from this material in China, and the fibre has been sent there from Singapore. In Eastern and Lower Bengal where the soil seems particularly well adapted to this plant, the fibre is not apparently appreciated though its strength and fine quality seem to be well enough known. In 1836 Dr. Wallich presented the Society with a bag which he had "purchased for a trifle at Cherra Poonjee" made of this material, he says the natives used the fibre for the manufacture of such small fancy articles. In his letter to the Society, Dr. Wallich says:—"considering the enormous quantities of pines grown in that region, the plant appearing as if it were quite a natural production, the fibre of it is worthy of attention." An allusion is made to it in a paper by Lieut.-Col. Walton, in the Asiatic Society's Journal for 1832, alluding to the great abundance of the Pine-apple plants in the adjacent valleys to Cherra Poorjee, "the sanitary station recently occupied by the East India Company," and that the natives use the fibre as a material for bags and pouches.

In 1839, Miss Davy, in answer to an advertisement published by this Society, submitted some thread made from Pine-apple leaves, of which she remarked that it was "equal to the finest flax thread manufactured in Europe," and considered it comparable with the best cambric thread. Miss Davy thought a beautiful table linen could be made with it, and a lace resembling blond. This lady eventually, though with some difficulty, owing to the conservative objection of the Dacca weavers whom she tried to induce to make some cloth from this fibre, manufactured handkerchiefs, cuffs, and some cloth which are alluded to in the proceedings as "elegant specimens." Some thread was sent home but the English spinners seem to have been as prejudiced against this fibre as the Dacca weavers were.

The methods employed for extracting the fibre in Manilla, China, and in the Khassia Hills, seem to be identical, the leaf is spread out on a board and scraped with a blunt knife, which removes the pulp and exposes the fibres, which are then raised, taken hold of at one end and pulled off the leaf with a jerk, the pulp which underlies the fibre is again scraped and the operation repeated, finally the fibre is combed and dressed like a handful of woman's hair.

I imagine the implement used in Mauritius for extracting the fibre of the Aloe leaf would be very suitable for the Pine-apple too, and as there is less pulp to deal with, the operation should be much quicker.

In this Society's Journal for 1853, some trials of various fibres made by Messrs. Harton & Co., of Calcutta, are published ; a 3½ inch in circumference rope made of Pine-apple fibre, easily bore the Government test, 42 cwt., and eventually broke with a weight of 57 cwt. 15 cwt., more than the Government breaking test.

RHEA FIBRE MACHINES.*Note by the Deputy Secretary.*

IT may be useful for future reference to record a short description of the different Fibre cleaning Machines tried before a Jury of the Calcutta International Exhibition.

The first and most important one, was that which has been known as Sir Walter de Souza's, though the maker or inventor's name is M. Berthel.

The Machine is a large one and though roughly made with no attempt at "finish," is strikingly ingenious.

The working parts consist of two drums, about 4' in diameter on the same shaft, driven at great speed the drums, which may be likened to large iron-wheels with tires nearly a foot broad, carry brass scrapers, fixed across about a foot apart from each other, all round their circumference; the drums have, just in front of them, semi-circular beds on which the plant rests while being scraped, these beds are adjustable by means of screws and can be made to touch the scrapers.

As it stands the machine covers about $12' \times 10'$ and is about 5' high, it is roughly of a triangular shape, at one point of which two rollers grooved longitudinally are fixed, through these the plants are fed side-ways, not length-ways as is usual. As they come through, they fall on to an endless rope which passes round continuously, they are quickly nipped at one end between the rope and a grooved wheel round which it passes, and there being no support for the other end of the stalk, are thus hung butt downwards. The revolving wheel and rope passes them round, till they are brought between the scutcher and the bed above described, where they are subjected to the action of the scrapers and pass on round the wheel; the rope after passing round the first grooved wheel is brought back to a pulley, and descends to another grooved wheel, similar to the first but some two feet lower down, round which it also passes. As the scutched plants come round with the revolving

upper wheel, their lower ends hang between the rope and the lower grooved wheel, which nips the lower ends at the same time as the upper ends are getting free, the freed upper ends fall over and by exactly similar means pass through the second scutcher, where the ends hitherto held under the rope get treated in their turn and pass out cleaned from end to end. It is difficult without a sketch to convey an idea of this exceedingly ingenious machine. .

The samples passed through the machine came out fairly clean but not altogether so, and there was a large amount of waste, and cut fibre. On the whole, however, the result was fair and decidedly better than was anticipated.

The next machine was a "New Zealand Flax Scutcher," small and compact-measuring about $3' \times 2'$.

It consisted of two drums or scutchers with scrapers of a novel shape fitted very close to each other round them, the drums are adjusted so as to have a very small space between them. On the top of the machine there is a small opening through which the plant is fed, it passes between two grooved rollers revolving rather slowly and falls between the two scutchers which are made to revolve at a very high rate of speed, the scutching is done while the upper end of the plant is still held between the rollers.

The trial was very unsatisfactory in its results, perhaps unsuited to the material tried.

The third machine was the invention of an Assamese, Hati Borúah, it was simply a number of vertical rollers in pairs, fitted with cogs and all driven by the same shaft, save in speed and material used, this machine was practically the same as the native Roller Sugar Mill, which has been so frequently brought forward by different people for the same purpose. Mr. Borúah himself brought two of them which were also tried though they were no novelty.

The only other implement tried was what is known as the Mexican Aloe Fibre Extractor. In 1881 the Agricultural and

Horticultural Society addressed the Government of Bengal on the subject of this implement with a request that a model of one should be secured for the Society. Accordingly in 1882 one was procured, a model, the working parts are exactly similar to the Sir Walter De Souza machine, *viz.* a broad wheel with brass scrapers fastened across the tire. The wheel is on a frame, and is made to revolve with great rapidity, the plant to be operated on is then fed in front of the revolving wheel on a curved board which is adjustable by means of a lever. The machine is as will be seen exceedingly simple, but is either inefficacious or the instrument received was of defective construction, as it cut the fibre greatly, and wastes as much as it prepares.

The following Report was forwarded on these machines by the Jury :—

CALCUTTA, 27th February 1884.

FROM THE JURY, SECTION I, CLASS 139,

TO THE SUPERINTENDENT OF JURIES,

Calcutta International Exhibition.

SIR,—We beg to submit our report on the Fibre Machines entered in Class 139, Section I.

We have on two different occasions witnessed the working of the machines entered for trial, and regret that we cannot express any favourable opinion as to the results they give; none of the machines produce the fibre in a state in which it would be of marketable value; however, we think, that honorable mention should be given to the machine known as Sir Walter de Souza. As though the fibre produced is not of great excellence, and there is a great deal of waste, and the machine does not do the work very rapidly, still it approaches nearer to the desired end, and the mechanical arrangements of the parts are exceedingly ingenious.

We trust that these trials will not prove entirely barren, but that the interest aroused by them will bear fruit in improved appliances, for which as has been shewn there is a large field and great demand.

We have the honor, &c.,

W. H. COGSWELL,

J. MACKILLCAN,

RICHD. BLECHYNDEN, Jr.

*Note on certain Chinese Plants Acclimatisable in the United States:**

BY DR. MACGOWAN, *corresponding member.*

In compliance with a request of Edmund Stevens, Esq., American Consul, Ningpo, concerning several plants and their adaptability to acclimatising in the United States, the following notes (with matter not strictly germane to the text) are respectfully submitted, being supplementary to others on the same subject already published; premising that besides the plants indicated by Consul Stevens, there are many more that merit attention which are left for discussion by other American observers in Chiua.

I. "Ningpo varnish" the commercial name of the *Chin Ch'i*, i. e. "golden varnish," is a compound article, the product of two trees that first require to be described.

The basis of Ningpo varnish is obtained from a tree which Dr. Bretschneider says has not been described [botanically]. It is a kind of *Rhus*, denominated *Angia Sinensis* by Loureiro, and has a wide range, extending from the inland mountains of Chehkiang to the extreme west of the empire; the provinces of Hupeh, Shensi, and Szechuan are the chief

* This note was kindly contributed by Dr. Macgowan, corresponding member to the Society. It has already appeared in an American paper I believe.

sources of supply. In old books, Shingking in Manchuria (N. Lat. 38, corresponding in soil and climate to New England), it is stated, produced the best article. Chinese botanists describe the *ch'i shu* (varnish tree) as like persimmon (*Diospyrus*) with flowers resembling *Sophora Japonica*, and leaves like *Cedrela odorata*, and having white bark: it is from 18 to 24 feet in height; and is compared by some to the ash. It is directed to be planted in the spring by one authority, and in winter by another: it is easily transplanted, and then, apparently, takes care of itself. In some places the sap is drawn in spring, and in others in autumn. Trees that are not vigorous are left until they are found in a thriving condition. The spot selected for operation is smeared with nut-oil (presently to be described), and an incision over an inch in depth is then made, by night, into the alburnum, into which a bamboo tube, cut obliquely at the point, is inserted, when the varnish gradually oozes out in a viscid condition and is passed through a gauze sieve. At first, its color is pale yellow; then it becomes reddish brown, and soon as black as ink, [thus resembling the black varnish tree of Birma. *Melanorrhcea Usita*.] An emperor of the middle of the sixth century once asked a courtier, "What is the blackest thing in nature"? "Varnish," was the reply. Yet as found in the shops the viscid mass is brown; it becomes black only when spread out and dried. Blackness is a test of quality; when it is pale yellow, it is inferior, presenting a honey-comb appearance: the best article is obtained with difficulty. It is frequently adulterated. Tests:—Seep up a small portion. If it is stringy, slow to separate, and, on breaking, at once retracts, it is pure. Daub some on a bit of bamboo; place it in the shade; if it dries quickly it is good. Fanned, the genuine article looks like a mirror; dipped up, it retracts like a hook; shaken, it presents an amber appearance; and beaten, it becomes frothy. It should be further tested by brushing it on bamboo; if adulterated with nut oil

it dries slowly and is lacking in blackness. It imports to sign boards which adorn Chinese streets, their jetty gloss, beautifully contrasting with their gilt lettering. When applied, a priming of soot of brassica oil is laid on the board, when it receives a coating of varnish, which when dry is rubbed smooth with glue, followed by a second coat.

A peculiarity of this article is its requiring a considerable degree of moisture to dry it. In damp weather, three days suffice ; in dry weather, several weeks are required ; a sudden fall of temperature in winter causes recently coated utensils to present a fractured, wrinkled surface. Ningpo cabinet makers use small chambers especially constructed for the drying process by artificial moisture ; they are plastered with mud—walls, floor, and door—which is well watered ; in these dark damp receptacles, varnished articles dry in a couple of days. The paradoxical statement that Chinese varnish requires damp weather for drying, is explicable by the wood on which it is laid being then more absorbent than when dry. Most wooden utensils in common use are of a bright red color, from the mixture of vermillion with the varnish : for coarse purposes, a ferruginous clay is used which imparts a dull red. New articles require to be washed several times after being used and sundried ; otherwise they are readily stained. When once thoroughly seasoned, the vitrious like coating resists the action of vinegar, salt and the like, and boiling water. The wood of the varnish tree is yellow colored ; it possesses no economic value. The acridity of varnish-poison is well known ; its emanation inflames the cuticle of about one per cent of natives who are exposed ; foreigners are more susceptible, Americans most of all ; no number of attacks afford immunity to the susceptible. Dealers in varnish and varnished articles, if removed for a time from its vapours are attacked as severely as the uninitiated, and are obliged to resort to prophylactic measures :—thrusting pine shavings into the nostrils, smearing themselves with nut-oil. The Chinese remedies for

the painful inflammation, are crabs' liver, and a decoction of pine shavings. I have found lead lotions the best application.

With regard to acclimatising the varnish tree in the United States, I advise that plants or seeds be procured in the West, although Japan (which also furnishes it) would be more convenient. When alchemy was in vogue, varnish was an important ingredient in elixirs of immortality; it is now used as an anthilmintic and emenagogue. This varnish was in use in pre-historic times. Among the arts communicated by the Chinese to Indo-Scythian peoples, was the preparation of varnish, from trees that they found growing in Northern India (second century B. C.), which the natives did not know how to turn to account; teaching them sericulture at the same time and the reduction of iron ore also; but it did not form a constituent of Ningpo, or golden, varnish until the Tang period (say eleven centuries ago) when the Ningpoese acquired the art of preparing it, by mixing it with nut-oil, which is next to be described.

Nut-oil, the "wood-oil" of commerce (a misnomer) is the product of the hill *t'ung-shu* and the green *t'ung-shu*, which have been designated *Eleaococca vermeosa*;—*Aleurites cordata-vermicia montana*; both kinds had better be designated "oil-nut trees." Were the Chinese to select a tree as a national emblem, the nut-oil tree would be unanimously chosen, having beauty, utility, and universality, to recommend it. Poets never weary descanting on it from an æsthetic point of view:—"Its bark has the hue of the kingfisher, its leaves (bracts) are like flowers; its elegance rejoices the heart and gladdens the eyes."

Williams styles it the national tree of China, among foreigners it is regarded as a fine umbrageous specimen of sylvan nature: nothing more.

The hill oil-nut tree, is the chief source of supply of nut oil—"wood oil"; it is sometimes called the "tiger oil-nut tree," from the poisonous nature of its fruit, and sometimes'

the "jak-n oil-nut" because its nuts resembles poppy capsules. It is of slow growth and is not lofty. It blossoms in spring, its flowers being pale red, producing a large round nut, each carpel containing two or three white seeds, having a sweetish taste and causing emesis. As its name implies, it grows on hills.

The green oil-nut tree, following still Chinese accounts, is sometimes called "coffin oil-nut .tree, because of its ancient uses, and sometimes the *wu* oil-nut : it is straight, with a pale green bark, having bracts which resemble the corolla. of a flower ; its wood is firm. It flowers late in May, it racemes, small and yellowish; carpeting the ground ; truly it is a beautiful tree." It produces fruit about the size of peas, in July and August, adherent to the margin of the bracts. Its leaves are the last to appear, and the first to become sear and yellow. Both species are similarly treated : planted early in February, the seeds being mixed with clay and saw-dust : to be freely watered every day. When a foot high they are to be transplanted from the nursery. The nuts are plucked when green ; if they are allowed to ripen they will be destitute of oil, and instead of being acrid and poisonous, will be edible. A rude press, such as I have described as used in separating stearine and oleine from the seeds of the tallow tree (*stillingia [erearia] sebifera*) is employed to express the oil from these nuts. Sometimes oil is cold-drawn, and sometimes heat is employed. The refuse is used for manure. Tallow tree oil is used as an article of adulteration, and also the still more inferior oil obtained from beans ; with those adulterations varnish takes a long time to dry, and is of little use. Spurious oil may be detected by scooping up a portion with a small bamboo loop ; if genuine, the oil will adhere in a film across the loop, like a parchment over a drumhead. It is in universal use, for houses and boats ; it is invaluable for caulking, and is used also in making the best kind of mortar. A mixture of glutinous rice congee, nut-oil, lime and sand

was used on the Wusung forts; lime is sometimes omitted. A great amount of pounding is required to render the compound perfect. Before using nut-oil for any purpose, it requires protracted boiling. When used for forming "golden varnish," nothing is added; but when used as a pigment, a small quantity of silver dross is added in boiling to facilitate drying, and at the same time a little white lead to impart lustre.

When applied, the wood is first smeared with pig's blood for dark red, and red clay for common red, and an infusion of flowers for yellow. Oil-nut wood is employed for musical instruments; the trunk for lyres, and the branches for lutes (their sonorousness differing). A species that is valued for its timber (being impervious to attacks of insects) does not produce nuts.

Its relation to folk-lore may be worth noting in conclusion. Among their innumerable modes of weather-forecasting, the Chinese say, that a leaf of this tree falls on the day and hour when the sun enters the 15th sec., 9th August; there is an odd leaflet terminating the pinnate whenever an intercalary month occurs; when the buds are very red, a drought will follow; when they are unusually white, it betokens a wet season.

After this tedious account of constituents of Ningpo varnish, the story of its preparation may be soon told. When the article is good, it is composed of equal parts of varnish proper and nut oil; but both ingredients are commonly adulterated.

It is now in order, to offer a few remarks on other varnishes. An important varnish is obtained from a wild persimmon *Diaspyros sp.* (the cultivated, and properly cultivated, fruit of China is very different from our styptic persimmon). Its sarcarp is left to decompose in tubs in its own juices, a little lime being added; in a fortnight, or so, it becomes a putrid foetid mass, which, when deprived of seeds, is an excellent varnish. Without it, umbrella makers could not pursue their

vocation ; two coats of it are laid on the paper (a tough material, the bark of the paper mulberry, *Broussonetia Papyrifera*) and then nut-oil is applied to kittysols and umbrellas. This is the varnish that is used to line willow baskets, in which bean-cake oil is stored and transported.

A varnish resembling that yielded by the persimmon, is obtained from what appears to be an alga ; its appearance is compared to the *Paonia albiflora*. China does not appear to produce a lac insect ; but an ant is found in Annam that secretes a varnish. When a spot is recognised as containing their nests, it is dug, and a bit of bark is stuck into the hole, when the ants emerge and secrete a varnish. I commend this entomological subject to French naturalists in Tongking for investigation.*

Dr. Breitschneider in his paper "Early European Researches into the Flora of China," states that Vol. xxii., Philosophical Transactions, contains an account of the way of making Chinese varnishes, sent by the Jesuits in China to the Grand Duke of Tuscany.

II.—*Yang-meï*, sometimes called tree strawberry, or arbutus for which the region about Ningpo is celebrated, "producing the best fruit of the kind in the Empire," Suao-hsing the coterminous department being included in the famous Yang-meï country. It is only the very best that foreigners care to eat ; as commonly found it is too sour. It resembles mulberry.

Cultivation.—Macerate the seeds in night-soil from the time of collecting, in May, for a month ; place them aside until March following ; then plant. When a foot high, transplant, or three or four years later when other trees are to be grafted on it, transplant on a hill with its surrounding earth. In January dig a semicircular trench about it from four to five feet distant, where the ground is higher than the tree, and

* Chü-feng in Ch'inghua (obsolete Sung names) is named as the habitat of the varnish ant.

place night-soil and ashes therein. Mulberry grafted on the yang-meï produces fruit without sourness. When the tree suffers from insects drive liquorice pears (*Glycyrriga*) into the affected part; it will act as an insecticide. Grafting fir on this tree is not named in the books, but is practised by the Ningpoese; hence the fruit has often a terebinthine flavor.

This grafting of yang-meï on fir, a matter so much at variance with horticultural canons on the art of grafting, invites digression. It has been authoritatively stated that grafting was introduced into China by Jesuit Missionaries. That is a mistake. If the art was communicated by missionaries at all, it was by Nestorians, for Su Tungpo, the great poet and statesman, and writer on agriculture as well, (1036 — 1101 A. D.) gives directions respecting the process. Perhaps it followed the introduction of the vine into China, in the second century B. C., or its origin may be traced to the colony of pre-Christian Jews, who erected a magnificent temple in Ch'êntu.

It is taught that growth by grafting can take place only among plants of the same family, or order. Chinese horticulturists teach nearly the same thing. The stock and shoot must be of the same nature, or must have a constitutional affinity, (an idea suggestive of a special classification). The grape furnishes another illustration. It is planted near a Zizyphus, which is perforated to receive a branch of the vine; when by its growth, the branch fills the hole, the vessels of both inosculating it is severed from its parent, and produces an improved grape. Persimmon is grafted on peach—a fact noted by D'Entrecalles (1741) and quoted by Bretschneider, who says he was unable to confirm it. Books, and common report also, say that the black date zizyphus (*Diospyros Lotus*,) is grafted on persimmon, and persimmon on that plant. At Hangchow a peach is brought to market called "White Willow peach," which is said to be obtained by grafting, one on the other. Chestnut is grafted on a species

of oak. Wencho pomelo cultivators are not content with grafting, until the fifth generation is reached,—that is on an engrafted branch of last year another is engrafted this season, and so annually until the fifth year. Chinese floriculturists are famed in their art, particularly in grafting. The *Olea fragrans* which flowers in Autumn, is in spring made to bear *Japanicas*. By grafting Buddha's finger (*Citrus Chirocarpus*) on a peony (*P. Moutan*) its vitality and fragrance are greatly prolonged although no union takes place. Much more might be said on this subject. Certes, if the Chinese did not originate grafting (it is clear they did not) they have cultivated it with signal success.

The kernel of the berry is recommended in "malarial leg," or beriberi, (a malady that elsewhere I have described as existing in China) and a decoction of the bark, or root is used in ulcers, and various cutaneous diseases; the ashes of the same are an antidote to arsenic; and are used also mixed with oil as an application to a scalded surface.

Annam produces a yang-meï, as large as a bowl from which a famous liquor is prepared.

III.—Lichi, (nephelium) the other article on which information is desired, is a delicious tropical fruit (of which there are between thirty and forty kinds) but is found as high as 30° N. in Szechuan. The kind most lauded in the books is produced at Huian in Fuhkien 25° N.

It is found on level ground adjacent to hills, and thrives best at a distance from water, although moisture and heat are essential conditions to its vigorous growth; it would not succeed in arid portions of the South; but the hummocks and high prairie land of Florida might prove adapted to its culture. Chinamen who have partaken of its fruit will generally concur, with an illustrious statesman and patriot Chang-chowling of the eighth century, who wrote a poem on Lichi, lauding it as incomparably the most luscious of fruits. Many attempts were made by the Emperor Wuti (140-87 B. C.) to

introduce it from Annam into his garden at Chang-an. For successive years hundreds of plants were brought from that distant region (as if the cultivation had not then extended to China), all quickly dying; at last one survived, but for a single season only when further attempts were abandoned.

In its contour, the Lichi is compared to an official umbrella or canopy, its name is descriptive of the toughness of its stalk funiculus "trebly strong," it resembles a large strawberry, its watery pulp is covered by a tenacious integument which is compared in books to lard; it encloses a hard seed. The leaves are compared to those of the orange, the seed to the *ligustrum lucidum*? *phyllodes placentaria*? In Kuangsi it grows on hills, in Kuangtung on plains at a distance from water: it is not easily cultivated, its roots tending to surfaces, rendering it necessary to pile on earth and manure, it flowers in March or April ripening in July or August. It requires to be protected by a covering from cold for its first five years, it is remarkably sensitive to frost, which destroys it, and to electricity; when there is much thunder, flowers and fruit are small; much rain is hurtful, and in a drought the tree bears no fruit; when exposed to musk emanations no fruit is produced, that drug causes the flowers to fall. When the fruit is cut from the tree, the operation must be completed at once, for birds and bats devour what remains;—those bipeds seemingly hold aloof until man has had the first cut.

Medical writers describe lichi as heating, but men have been known to eat a thousand a day. Su Tung-po allowed himself three hundred per diem, and so delicious were they that the poet declared they might reconcile one to eternal banishment;—the poet was in exile at Canton. As a medicine it is given to hasten small-pox pustules, and in the delirium of fever accompanied by thirst it tranquillises; it is used as a topical application, in boils, and tumors, and in toothache. Alchemists, had much faith in lichis. It is stated in the Genii Records that there were those who, from having attained immortality

from using its flowers and fruit, were denominated "lichi genii." Ko Hung, the highest authority among Taoist philosophers, lauded it as a "marrow tonic." Having attained the age of 81 that mystic joined the immortals (fourth century A. D.) becoming one of the genii; lichi then ceased to fortify his marrow.

Lichi has a history. It was first sent as a tribute (dried) to the Emperor Kao-tsu about 200 B. C. Later it was obtained from Annam (?) in a fresh state (they keep fresh for a week or ten days; the dried are preserved for about a year) at a frightful cost of human life. To reach Chang-an in good condition, relays of men were required to run at full speed bearing a load of lichi, each man's task being fixed at five *li* with a moment's rest half way, vast numbers succumbed to the toil from sunstroke by day, and from wild beasts and venomous serpents by night, and from malarial fevers.

The corvée was resumed in a form somewhat similar, about the middle of the eighth century. As one of the means employed to gratify Princess Wang, a pony express was established to bring lichis from her birth place in Szechuan:—at great sacrifice of human and equine life. The Princess was "transcendently beautiful—" "une belle sauvage" however. Charmed by her talents, and smitten by her beauty, the Emperor Hsuan Tsung made her chief lady of his harem, mollifying his son, whose wife she was, by another from the seraglio.

This Lichi Princess is of interest to us, not on account of her eventful history but from an ethnic point of view, being (remotely) related to us. [It is easy to discover the style of her beauty by examining the group photographed in De Lagnée's and Gamier's, "voyage de exploration en Indo-Chine;" the central figure is undoubtedly Aryan.] Eight hundred years later, the tree from which the fair Lichi Princess obtained fruit was cut down by order of a magistrate; it had ceased to bear fruit, the wood was made into combs.

Through many weary ages, cultivators of lichi suffered exactions from Imperial agents, who were sent from local yamen to collect that fruit as tribute. In 1821 Taokuang signalled the commencement of his reign by abolishing the oppressive practice.

Of tardy growth, the lichi is remarkable for its longevity. The citizen who succeeds in acclimatizing it, will be a benefactor to posterity : it does not mature until it is fifty years old, but it will continue to bear fruit for four or five hundred years, say, far into the twenty-fourth century, and judging from the history of the lichi tree that our fair kinswoman, Princess Yang found so toothsome, the timber may be utilized late in the twenty-eighth century, A. D.

WENCHOW, October 1883.

CHINESE AQUATIC VEGETABLES.

The following postscript to Dr. Macgowan's article on plants acclimatizable in the United States reached us lately :—

Why not experiment with Chinese water plants? Those of the sub-tropical latitude would take kindly to rice regions and to marshy lands generally,—where waters do not freeze, or freeze but lightly. Among these valuable esculents is the water caltraps, (*Trapas bicornis*, *ling chiao*—buffalo-horn) sometimes called water chestnut, because of its flavour ; it does not furnish much in the way of food, like the *Trapa bispinosa* of Cashmere, but it is valuable as a fruit, enduring the severe climate of Chihli and requiring no culture. The next in value is a tuber, (*Blochcharis tuberosus*) water chestnut, although the water lily (*Nelumbium speciosum*) perhaps is more used for food (in some places people are veritable lothophagi) ; it appears to be the Egyptian bean of Pythagoras. It is rich in starch ; its root-stock and seeds are alike edible ; its arrowroot is much used by invalids ; its leaves are used for wrapping-paper, while its flowers are strikingly gorgeous and not without fragrance.

Another of the numerous water plants of the Chinese is

the celery-like shoots of the *chiao-pai* (extending far north), and yet another is the *chin-tsai*, water celery, which is planted on bamboo rafts covered with mud, forming floating-gardens like those of ancient Mexico, and modern Kashigar.

Let the plants be securely placed in Ward's cases, and an account of the mode of culture sent with the specimens. If any ornamental plants are sent, let me commend for the sunny south, or for conservatories, the *t'ieh-shu*, iron tree, the most beautiful of the *cycodacieæ*. Its name comes from its property of absorbing and assimilating iron; when it shows signs of decadence, nails are driven into its trunk, which gives it a new lease of life. The *tiao-lan*, hanging epidendrum, would be much prized; it flowers only when taken from the ground and suspended from a ceiling.

I omitted to state respecting the nut-oil tree, that it would prove easily cultivable in any part of our continent.

M.

NOTES ON MAIZE OR INDIAN CORN.

AN article under the above heading appeared in the last Journal, and as certain communications on the subject were received subsequent to its issue it has been thought advisable to transfer them from the Proceedings to the body of the Journal where they will be more accessible.

Mr. Parsons, 26th March 1883.—“ In continuation of my letter of the 20th ultimo, I am sorry to inform you that from enquiries made in Merwara, it appears that the cultivation of the Maize introduced by Col. Dixon was abandoned, in consequence of the cultivators being unable to secure good crops from it.

I can readily believe this to have been the case, both from acquaintance with the people, and the result of my own efforts in this district.

The whole of my own experience and all reported cases I

have met with have been to the effect that it is quite useless to make over exotic seed to native cultivators. The invariable report is that the seed either did not germinate or that it was unsuited to the climate.

Two days ago I sent you a packet containing samples of the following kinds of Maize :—

1. Pennsylvania yellow Flint Corn.
2. Golden Dent Corn.
3. Tuscarora Corn.

All three kinds as imported from America.

Also a packet of each of these kinds one year acclimatized from the above seed.

A packet of Maize grown in the Ajmere district.

Ditto in the Merwara district.

Ditto which I have grown here two seasons, from seed obtained from Jounpore, N. W. P.

You will observe how much the American kinds have lost in size, by one year's cultivation in this district. Of the first mentioned kind 40 grains of imported, weigh down 63 of the acclimatized ones. What the second year's result would be it is not possible to say, but probably a further decrease in size.

Now this corn has been grown on land far better than the generality of natives possess, so that it is not difficult to foresee what the result would be in their case, and the upshot in Col. Dixon's time was no doubt unfavourably and very rapidly developed.

The experiment seems very much against us, but the out-turn, cost of production, and value of the crop in America, would have to be compared with the same things here, before a correct estimate could be made of the extent of our failure.

It would be possible no doubt in many parts of India, to do better than we have done here, but my own opinion is that America is not the proper market to go to for our Maize for seed purposes.

The same thing happens I have been told with potatoes,

raised in England from American produce. The crop, with many kinds, deteriorates in the course of a few years, until the cultivation is ultimately abandoned."

The Secretary, 30th March 1883.—"I have just received your letter of the 26th instant and hasten to thank you for it. I have also received the various specimens of Maize therein referred to. I note your remarks in respect to your experience of the deterioration of crops raised in this country from American Maize.

The object of the Society, in importing steadily such seed for the last 45 years, has been the hope of gradually improving on the country varieties, or rather introducing better kinds, and where attention has been carefully given to the culture, this appears to have been effected. We received a few weeks ago, specimens raised in the Garden of the Durbhungah Raj from American stock, fully equal, if not superior to the original, but it was carefully manured (See our Proceedings for 1st March.)

Only yesterday, I was informed by a visitor that he had seen cobs raised in a Garden in Chumparan, from American seed obtained from the Society, 18 inches in length, which is much larger than the imported kinds of 14 inches. The manure employed was "Sittee" from indigo vats."

Mr. Parsons, 5th April 1883.—"With reference to your letter dated 30th ultimo, I wish to offer the following remarks, as I appear to have conveyed an impression I did not intend.

In writing to you on the 26th March I was thinking more of Agriculture than of gardening, and had no thought of deprecating the attempts your Society has made in introducing superior varieties of Garden and Agricultural products.

The success you refer to at Durbhungah is, I presume, strictly a garden one, and obtained under special advantages which very few natives possess.

You remark that it was "carefully manured," and this strikes at the whole root of the matter, it is hopeless to expect

any improvement in native agriculture until the people are in a position to improve their land, and until they have the means of doing this it is perfectly useless giving them improved seed, which they are compelled to grow under conditions not at all conducive to success.

If the quality of the Maize grown at Durbhungah can be maintained under conditions such as a good cultivator could give it, then indeed a great step will have been gained, but if on the contrary it deteriorates until it becomes like his own indigenous produce, nothing will have been gained except a knowledge of what to avoid.

The Maize which we import from America, is no doubt grown under conditions of soil and climate which cannot be fully imitated in this country on a large scale, and if it could it would not pay to do it. I think more would be gained for native agriculture in the long run by steady attempts to improve many of the crops we already have, than by importing seed from America.

At the same time attempts need not be neglected to try what the produce of seed, obtained from the Cape and other places would result in.

Many of the cobs I grew here were over a foot long and large in proportion, but as the samples I sent you show, the individual grain had considerably fallen off in size.

The crop was grown on land more heavily manured than natives could afford, but the experiment does not justify any expectation of future success in this district, even under such improved conditions.

It is no doubt impossible to lay down a hard and fast line as to what will answer in different districts, but to improve agriculture among the masses a good deal more is required than giving them good seed. They do not appreciate our well intentioned efforts, or if they do so, their poverty compels them to grow such kinds as they have proved by expe-

rience will yield fairly remunerative crops, readily saleable in their own locality."

In the November proceedings mention is made of some Maize cobs, grown by the Kowar Jai Narain Singh of Didwary, two specimens each of nine sorts of Maize were forwarded by Captain Pogson, who mentions that they were grown from some acclimated seed, the parental stock being seed sent him by the Society. The cobs show no deterioration either in size or quality. Captain Pogson thinks that, this would prove that latitude, soil, and climate being consulted, upper India is capable of producing all varieties of Maize, equal to American, with the exception of the Cuzcot but he is sanguine that this too will thrive in its proper locality if ascertained.

Mr. Parson's remarks are deserving of great consideration, but the Society have now great hopes, of their consistent efforts to improve this extremely valuable grain in India by importing good seed, bearing fruit. They cannot but consider that America, the home of the Maize, and the place from whence the original seed was imported into India, is still the proper quarter from whence to introduce what may be called new blood. The seed depôts which there is some talk of the Government establishing, will have the effect of giving some permanency to the Society's efforts, as seed from the stock annually imported and distributed by the Society, will now no doubt be selected and re-distributed, and intelligent help thus be given within the country itself.

Correspondence and Selections.

EXPERIMENTS WITH INDIAN WHEATS.

TRANSFERRED FROM PROCEEDINGS OF 25TH JULY, 1883.

IN October last, Messrs. McDougall Bros. of London, were instructed by the Secretary of State for India, to institute a series of experiments with Indian wheat, in order to ascertain how they compared as to yield and quality of flour with American and other supplies. Conditions under which the experiments were to be conducted, are thus set forth by Messrs. McDougall.

1. That we should take a given quantity of each of these four representative Indian wheats, *viz* :—Indian fine soft white, Indian superior soft red, Indian average hard white, Indian average hard red, and manufacture them into flour by the ordinary process of grinding under millstones. Also that we should take similar quantities of the same wheats and manufacture them into flour by means of crushing between rollers, according to the system known as the Hungarian, or roller system. II. That we should take a given quantity of each flour so produced, and manufacture it into bread. III. That we should note the qualities and other characteristics of the flours produced, also of the offals, *viz.*, middlings, pollard, and bran. IV. That we should procure the following representative wheats, of fair average quality of the season, as then being sold on Mark Lane market, and, for the purpose of obtaining results for comparison, deal with them precisely as above indicated, both as regards flour, bread, and offals, *viz.*—English average, American (red winter), American (spring), American average, Californian average, Russian Saxonka, Russian Taganrog, Russian Kubanka, Russian Chirka, Egyptian Buhi, and Egyptian Saida.

As none of Kubanka or Ghirka qualities of Russian wheat could be obtained in London, these could not be included in the tests. Of each of the other wheats specified, however, 5,000lbs. were taken as delivered from the ship (weight of sacks or bags not included,) and subjected to the treatment specified, the operations being carried out in Messrs. McDougall's own mills and bakeries, under the personal supervision of one of the partners of the firm. And first as to the milling, the results obtained are shown in the following table:—

SYNOPSIS and COMPARISON of RESULT OBTAINED from INDIAN and OTHER WHEATS, by Two SYSTEMS of MILLING. Figures with (a).—System : Grinding under millstones. Figures with (b).—System : Crushing between rollers. * In Liverpool. † In London.

Experiments with Indian Wheats.

No.	WHEAT.	Value in London per 45s lbs. net wgt. on day of valuation.	Wgt. per Bush.	Weight of 100 separate Grains of the Wheat.	Quantity used.	Impuri- ties re- moved.	Water absorbed to render mellow.	YIELD.			Evap- oration and Loss.	Gluten by water test.
								d.	d.	lbs.	Grs. avd.	
1	Indian (fine soft white) ..	a49 0	64	55·4	5,000	1·52	2·0	77·46	82	88	12·0	1·40
	" (superior soft red) ..	b49 0	64	55·4	5,000	1·52	2·0	74·10	87	4·0	2·68	6·8
2	" (average hard white)	a45 0	61·8	51·8	5,000	1·72	3·6	78·40	9·9	9·4	3·6	9·3
3	" (average hard red)	b45 0	62·3	51·5	5,000	1·72	3·6	75·4	7·7	18·5	5·3	9·8
4	" (average hard white)	a44 0	60	68·3	5,000	3·7	8·4	80·52	7·8	10·0	8·3	5·1
	" (average hard red) ..	b44 0	60	68·3	5,000	3·7	8·4	73·2	10·3	14·3	3·1	8·8
5	English	a43 0	61·1	77·7	5,000	1·2	7·6	79·55	7·8	13·20	8·0	13·4
	"	b43 0	61·1	77·7	5,000	1·2	7·6	74·21	10·3	13·8	8·0	5·1
6	Australian	a49 0	60·7	57·4	5,000	1·7	7·6	65·2	1·1	9·7	1·7·2	18·1
	"	b49 0	60·7	57·4	5,000	1·7	7·6	70·3	7·7	9·2	0·2	10·9
7	New Zealand	a50 6	62·1	80·5	5,000	1·5	7·9	75·8	1·1	7·4	14·4	3·3
	"	b50 6	62·1	80·5	5,000	1·5	7·9	73·1	8·0	9·8	11·5	5·5
8	California	a48 0	62·4	67·3	5,000	1·5	7·9	76·1	7·8	6·6	5·6	9·0
	"	b48 0	62·4	67·3	5,000	1·5	7·9	71·1	1·7·2	9·2	1·7·2	1·9·8
9	American (winter)	a49 6	61·4	49·6	5,000	1·5	7·9	70·1	1·4·5	6·3	3·9	8·7
	" (spring)	a48 0	61	35·5	5,000	1·5	7·9	73·8	1·3·3	7·9	16·4	1·0·2
10	Russian (Saxonsk)	b48 0	61	35·5	5,000	1·5	7·9	71·5	10·3	11·2	3·1	3·4
	" (hard Taganrog)	b52 0	60·1	57·3	5,000	1·9	7·9	72·9	2·4	7·2	14·7	15·3
11	Egyptian (Buh)	a49 0	61·4	57·3	5,000	1·9	7·9	69·5	12·1	10·4	3·8	14·6
	" (Saida)	b43 6	61·4	57·4	5,000	1·9	7·9	73·0	11·2	11·6	7·7	22·1
12	"	b43 6	61·4	57·4	5,000	1·8	2·4	71·4	12·5	11·7	3·3	23·2
13	Egyptian (Buh)	a49 0	61·4	64·7	5,000	1·8	2·4	76·2	1·2·2	12·7	8·1	17·6
	"	b47 0	59	50·1	5,000	2·7	2·7	72·9	9·6	12·1	5·0	2·9
14	"	a43 6	59	61·1	5,000	2·7	2·7	69·9	10·4	11·0	8·5	14·4
	"	b43 6	59	61·1	5,000	2·7	2·7	67·8	6·5	11·4	7·5	7·9
	"	b43 6	57·5	61·4	5,000	2·7	2·7	67·8	7·2	4·2	6·9	4·2

The Offals.—This is a subject of minor importance as compared with the yields and qualities of flour and bread, and it is only needful to state that, of the offals included in these returns, the middlings from both systems of milling were worked down to the quality, known on the Mark Lane market as "coarse mids, fair average," the bran, to "bran from stones," and "bran from rollers," and the pollard, to "pollard, fair average."

Gluten in Bread.—From an economical standpoint it may be said the nutrition of bread mainly depends upon the gluten, or, in other words, the nitrogenous or albuminous compounds or flesh formers, contained in the flour from which it is produced. The starch would be equally important if it could not be obtained from other sources in as suitable a form at a much cheaper rate—as in rice, Indian corn, and potatoes. But the gluten is not obtainable from other sources, of equal quality and flavour. Hence its special value as a constituent of wheat. Further, upon the gluten in flour depends the elasticity of the texture of the bread, and consequent freedom from density or heaviness. It is generally believed that upon the percentage of gluten in flour depends the yield of bread that may be obtained from it, as illustrated by the Hungarian flours, which are almost unequalled for, *i.e.*, of bread, and rank high in gluten; but this is erroneous, as proved by the experimental workings now under review. It would be found that the flours high in gluten do not produce the best bread unless, at the same time they possess a high degree of dryness, for it is upon the dryness of the flour that the yield of bread mainly depends, and not upon the gluten. The two lots of flour from Russian wheats (Nos. 11 and 12) are those which are high in gluten yet they do not yield as much bread as any of the four Indian wheats (Nos. 1 to 4), and the difference in yield from the latter would have been still further increased had they not been previously mellowed with water, as noted, before milling; confirming that it is the dryness of a flour that determines the yield of bread.

Another erroneous idea is, that upon the quantity of gluten present depends the height or loftiness of the bread. This would be correct, provided the fermentation of the dough were in all cases carried to a precise degree; but it varies widely, and it will be found the loftiness or height of the bread depends chiefly upon a high degree of fermentation, provided it be not carried to great excess, rather than upon the gluten. This is illustrated by the bread consumed in the London district, which is made from flours rich in gluten, yet is not so high or lofty as the bread consumed in some other districts, which is produced from flours containing much less gluten, the popular taste in London demanding strength, nutrition, and then fair color, whereas, in the districts referred to, a high degree of whiteness is demanded before nutrition.

THE FOUR INDIAN WHEATS.

In addition to the particulars contained in the foregoing returns, we have to report that to any one experienced in the requirements of the wheat and flour markets of the United Kingdom, and, indeed, of most other countries, it will be evident there is no probability of these Indian wheats coming into demand for manufacture into flour *without a liberal admixture* of other wheats. They all possess in a marked degree the same characteristics of great dryness, and a distinct beany and almost aromatic flavour inseparable from wheats grown in the climates and soils of the tropics. Also the flours are ricey, the texture of the breads is too close, and the crust is hard and brittle. But these characteristics do not detract from their usefulness in any important degree. As is well known, a miller cannot show skill in his craft to greater advantage or profit than that with which he selects his wheats, and mixes his grists, so as to produce to best advantage a flour from which bread can be made of the colour, bloom, strength, and flavour desired, and with all a good yield.

We pronounce them to be exceedingly useful wheats, in fact, hardly equalled for what is deficient and wanting in the English markets, by any other wheats. Their chief characteristics are just those in which the wheats grown in our variable climate are most deficient. Their great dryness and soundness render them invaluable for admixture with English wheats that are in any degree out of condition through moisture, and the great proportions of the wheats harvested here have been in that condition for some years past, a condition that must prevail in all other than that of wheats harvested and stored during fine and favourable weather; and this the English farmer knows, greatly to his cost, is a state of climate that is by a long way the exception rather than the rule. Added to their dryness, the thinness of the skins of these wheats, and consequent greatness of the yield of flour, must always place them in the front rank as a "miller's" wheat, wherever they are handled with reasonable intelligence and skill.

Such unprecedented yields of flour, as shewn by these wheats ranging (by ordinary grinding) from 77·46 to 80·52 per cent. against English 65·2 and American spring 72·2, speaks volumes in their favour, and their value is still further increased by another point of merit of almost equal importance, *viz.*, a larger percentage of bread may be obtained than from any other of the flours included in this review.

That, for the best of these Indian wheats (the fine soft white), on the day they were valued on Mark Lane market, a price was offered as high as that for American winters, New Zealand or English (See list of values in synopsis), proves that the great value of Indian wheats is becoming recognised here, a knowledge that

will ere long extend to all our markets. The other lots of Indian (Nos. 2, 3, and 4) were lower in value to the extent of 4s. to 5s. per quarter, as might almost have been expected from the difference in colour and other characteristics; still, as these latter wheats become better known here, this difference in price will be somewhat lessened. Their beany flavour is not a serious obstacle, as fair average deliveries when well cleaned and properly dealt with, can be employed in the proportion of 25 per cent. to 50 per cent. along with home-grown or other wheats, such as Americans, possessing a fine sweet, milky or nutty flavour.

Glancing at all the facts here elaborated, it is evident that these wheats afford a larger margin of profit both to the miller and baker than to any other.

We venture to record a conviction we have long held, strongly emphasised by the results of these experimental workings, of the measureless importance of the great resources of the Indian Empire being developed to the utmost in producing wheat for this country. Farmers here are finding that to live they must produce beef and mutton rather than grain, hence the greater need of resources of supply under our own control.

It is evident such a conviction is common to the members of your Honourable Council, as testified by their unceasing efforts in this direction. And we desire heartily to congratulate them upon the important fruits arising from their labours. The character and general excellence of the Indian wheats are improving with the deliveries of each successive season. The Indian wheats now specially under review were delivered to us in excellent condition (see details,) with freedom from dirt, (except Lot No. 3) barley, gram, and other impurities, also with a freedom from weevil, rarely equalled by Indian wheats, except the prime parcels of the past season, and there is no doubt an outlet in this country and the European continent for unlimited quantities at prices that shall prove remunerative to all parties concerned, either in their growth, transportation, or conversion into flour and bread.

When the manufacture of the wheats into flour was completed, Messrs. McDougall proceeded to convert into bread a given quantity of each flour from the Indian wheats by both systems of milling, and from the remaining wheats by the roller system, with the following results:—

RESULTS OBTAINED in CONVERTING the FLOURS into BREAD.

NOTE.—Of Lots 1, 2, 3, 4, Indian wheats, the stone flours and roller flours were made into bread. Of Nos. 5 to 14 inclusive the roller flours only were made into bread.

No.	WHEAT.	QUANTITIES USED.				Yield of Bread when Goo'd.	PERCENTAGES.	REMARKS.			
		Flour.	Brown Yeast.	Water.	Liquid Potato Ferment.			Per centage of Bread to Flour.	Per centage of Water to Flour.	Colour, Flavour, & texture.	General Characteristics.
1	Indian (fine soft white)	280	1	30	31	141.4	364.0	130.0	60.5	10	11
2	" (up' soft white)	280	1	30	31	149.6	367.5	131.2	52.4	13	13
3	" (av.' hard white)	280	1	30	31	141.7	372.0	133.0	50.6	8	10
4	" (ever. hard red)	280	1	30	31	147.0	382.0	129.3	52.3	12	13
5	English	280	1	30	31	145.2	375.6	134.5	53.4	6	7
6	Australian	280	1	30	31	147.4	365.0	130.3	52.2	9	10
7	New Zealand	280	1	30	31	150.0	352.0	125.7	46.4	13	13
8	California	280	1	30	31	184.2	355.4	126.9	48.0	12	12
9	American (winter)	280	1	30	31	182.0	349.0	124.0	47.1	12	12
10	" (spring)	280	1	30	31	180.0	354.0	123.5	46.4	8	10
11	Russian (Saxonska)	280	1	30	31	130.0	336.0	127.1	40.4	8	9
12	" (hard Taganrog)	280	1	30	31	145.4	354.5	126.6	51.9	10	11
13	Egyptian (Buhl)	280	1	30	31	186.8	362.0	129.3	45.9	7	6
14	" (Saada)	280	1	30	31	144.4	353.0	127.7	51.6	4	4

On these results Messrs. McDougall report as follows :—

The Evaporation and Loss in Milling.—The percentages under this heading, it will be noticed, vary considerably from, No. 11, Russian Saxonska, stones, 0·7 ; rollers, 0·2 ; to, No. 13, Egyptiau Buhi, stones, 5·5 ; rollers, 5·4. These variations must not be attributed chiefly to the differences in qualities of the wheats, as they arise mainly from the waste and loss that is inseparably from working small quantities on a practical scale; about ten quarters of each wheat were operated upon in these experimental workings, whereas in ordinary milling a “grist” will run from one thousand to several thousand quarters. This will be readily understood, when it is borne in mind that, after the working of each separate wheat by either process, the stones or rollers, hoppers, elevators, dressing silks, &c., have to be swept out, and it is impossible to avoid some waste from this cause. In milling operations it is found there is a larger loss, &c., “unaccounted for” on inferior wheats than upon good wheats, but it does not exceed a total 1 to 2 per cent. For practical purposes, the items evaporation and loss should be taken as obtained by the competent millers, *viz.* :—From stones, 1 to 2 per cent.; from rollers, 1 to 3 per cent., according to the qualities of the wheats.

Water used in bread-making.—The differences in the quantities of water required by each of the flours from Indian wheats per 280 lbs. flour in making them into bread (ranging from 149·6 lbs. to 141·0 lbs. water) is partly accounted for by the fact of somewhat similar variations in the water absorbed in rendering the wheats mellow for milling.

Weight per Bushel of Wheats.—These experimental workings have brought to light a fact well worth noting, *viz.*, that the rule so generally held amongst wheat seller and buyers, and thought to be without an exception, that the greater the weight of a bushel of wheat so much higher must it rank as a flour yielder, and consequently in value, must now be regarded as true only within a strict limit. A high standard of weight for any given cubical measurement is, no doubt, a good criterion as to dryness of condition and soundness of the grain, for any dampness in grain causes it to weigh *lighter* per bushel or quarter of measurement instead of heavier (a fact which will surprise the uninitiated). But experienced parties will study with interest the three columns in the synopsis of the wheats showing “weight of 100 separate grains” of each wheat, “weight per bushel,” and “yield of flour.” Taken equal weights of the four Indian wheats, it will be found that No. 3, weighing 60 lbs. per bushel, yielded more flour than No. 1, weighing 64 lbs. also that No. 4, weighing 60 lbs. per bushel, yielded more flour than No. 2, weighing 62 $\frac{1}{4}$ lbs. The reason of this is evident. The four wheats were equally and perfectly dry,

and probably would have weighed the same per bushel had the size and shape of the grains of each wheat been the same, but they differ widely in this respect, Nos. 1 and 2 being medium or small, and Nos. 3 and 4 long and arched. Hence the latter will not fill into the measure as closely as the former, leaving larger spaces unoccupied, and causing any given measure to weigh less in consequence. The old rule holds good for wheats the grains of which in size and shape are similar, but it will only mislead if applied to Indian wheats like Nos. 3 and 4. It was, doubtless, adopted at a period when it was the custom for all wheats to be sold by measure, and for sales by measure, it is still a correct guide, but as sales are now made by weight rather than by measure, the rule can only safely be applied within the limits indicated.

REMEDIES FOR INSECT PESTS—THE ACTION OF INSECTICIDES.

FROM REPORT OF THE DEPARTMENT OF AGRICULTURE, WASHINGTON, U. S., 1881-82.

IT remains to examine the action of insecticides and to give the results of experiments made during the past season, 1881-82 under the direction of Professor Riley, the Entomologist of the Department of Agriculture.

From what has been said of the nature and structure of the horny covering that protects the three diaopinous scales, with which we are chiefly concerned, it will be seen that application of solid substances are not likely to prove practicable, and that for chief and effective remedies we must look to penetrating liquids.

The cost of alcohol renders its extensive use as a solvent impracticable. The volatile oils are as a rule powerful insecticides, but as they reach the insect from beneath by penetrating the bark of the tree, and are all to a greater or less degree injurious to vegetation, their use undiluted can in no case be recommended. Some of the light oils, *e. g.*, naphtha, turpentine, &c., are extremely hazardous remedies, and experiments with them are known to have resulted in the destruction of the orange trees upon which they were applied.

Kerosene.—The value of this substance as an insecticide is too well known to need further testimony here. Of all the light oils which I have tried, or of which I have any knowledge, it is the least injurious to plants of the citrus family. Refined kerosene, separated from the deadly naphtha oils, has frequently been used undiluted, without injury. Crude petroleum is said to destroy the bark, and even the refined oil if applied in the hot sunshine, completely defoliates the tree. Applied in the

shade, at sunset, or in cloudy weather I have never known any serious injury to result from its moderate use. The tree invariably loses the old and devitalized leaves, but young and vigorous growth, especially tender sprouts and budding leaves, are entirely unharmed by it. Nevertheless, so many cases of loss are reported that its use, undiluted, must be considered dangerous. In very fine spray, and with proper precautions, pure kerosene can probably be used with impunity, but all attempts to apply it in small quantities with other liquids, by dashing them together, should be discouraged as dangerous, or at best unsatisfactory, since it is impossible in this way to insure an even distribution of the oil to all parts of the plant.

There is, however, a safe and ready method of diluting kerosene and similar oils, and rendering them mixible with water. This method, as has been indicated by Prof. C. V. Riley (*Scientific American* of October 16th, 1880), is to emulsify the oil with milk.

The want of success which has attended former experiments with emulsions of kerosene and milk (see Department Report, 1880, page 288) is due solely to failure in properly combining the ingredients, and the consequent use of an imperfect or unstable emulsion.

The process of forming a perfectly stable emulsion of kerosene and milk is comparable to that of ordinary butter making, and is as follows: The oil and milk in any desired proportions are poured together and very violently dashed or churned for a period of time, varying with the temperature, from fifteen to forty-five minutes. The churning, however, requires to be much more violent than can be effected with an ordinary butter-churn.

The aquapult force pump, which is also the most effective instrument I have seen for spraying orange trees, may be satisfactorily used for this purpose where moderate quantities only are required. The pump should be inserted in a pail or tub containing the liquids, which are then forced into union by continuous pumping back into the same receptacle, through the flexible hose and spray-nozzle. After passing once or twice through this pump the liquids unite and form a creamy emulsion, in which finely divided particles of oil can plainly be detected. This is as far as the process can be carried by stirring or by dashing in an ordinary churn; the product at this point will not bear diluting with water and separates or rises at once to the surface. On continued churning through the pump the liquid finally curdles and suddenly thickens to form a white and glistening butter, perfectly homogeneous in texture and stable.

The whole amount of both ingredients solidify together, and there is no whey or other residue; if, however, the quantity of the mixture is greater than can be kept in constant agitation, a portion of the oil is apt to separate at the moment of emulsi-

fication and will require the addition of a few ounces of milk and further churning for its reduction.

This kerosene butter mixes readily in water, care being taken to thin it first with a small quantity of the liquid. The time required to "bring the butter" varies with the temperature. At 60° F. it is half to three quarters of an hour; at 75°, fifteen minutes, and the process may be still further facilitated by heating the milk up to, but not past, the boiling point. Either fresh or sour milk may be used, and the latter is even preferable.

The presence of kerosene does not prevent or hinder the fermentation of the milk; on standing a day or two the milk curdles, and although there is no separation of the oil the emulsion thickens and hardens and requires to be stirred, but not churned, until it regains its former smoothness.

If sour milk is used no further fermentation takes place, and if not exposed to the air the kerosene butter can be kept unchanged for any length of time. Exposure to the air not only permits the evaporation of the oil but also of the water necessary to hold the oil in emulsion; the kerosene slowly separates as the emulsion dries up and hardens.

Kerosene emulsions may be made of almost any strength; the quantity of milk required to hold the oil does not exceed one-tenth. But emulsions containing over 80 per cent. of the oil have too light a specific gravity and are not readily held in suspension in water. On the other hand, in the process of emulsification, kerosene loses a portion of its value as an insecticide, and emulsions containing less than 30 per cent. of the oil, although they do not at all, or only very slowly, rise to the surface when diluted with considerable quantities of water, are nevertheless too much weakened for effective use against scale insects.

The killing power of a diluted emulsion depends less upon the amount of emulsion used in the solution than upon the percentage of oil contained in the emulsion. To increase the efficiency of an application we should rather add to the percentage of oil in the emulsion than increase the gross amount of emulsion used in a single application, the amount of the diluent remaining in each case the same. As the result of numerous experiments I would recommend an emulsion consisting of refined kerosene 2 parts; fresh, or preferably sour, cow's milk, 1 part (percentage of oil, 66 $\frac{2}{3}$). Where cow's milk is not easily obtained, as in many parts of this state, it may be replaced by an equivalent of condensed milk (Eagle brand) diluted with water in the proportion 1 to 2. As the cans of condensed milk usually sold in the stores, contain exactly 12 fluid ounces (three quarters pint), the following receipt will be found a convenient one:

Kerosene	... 1 Gallon	= 8 pints	= 64 per cent.
Condensed milk	2 cans	= 1 $\frac{1}{4}$ "	} = 36 per cent.
Water	... 4 cans	= 3 "	

Mix thoroughly the condensed milk and water before adding the oil; churn with the aquapult pump until the whole solidifies and forms an ivory-white, glistening butter as thick as ordinary butter at a temperature of 75° F. If the temperature of the air falls below 75° warm the diluted milk to blood heat before adding the oil.

In applications for scale insects the kerosene butter should be diluted with water from 12 to 16 times, or 1 pint of butter to 1½ gallons (for chaff scale); 1 pint of butter to 2 gallons (for Long scale). The diluted wash resembles fresh milk, and if allowed to stand, in two or three hours the emulsion rises as a cream, to the surface. The butter should therefore be diluted only as needed for immediate use, and the mixture should be stirred from time to time.

A wash, prepared in accordance with the above directions, will kill with certainty all the coccids and their eggs, under scales with which it can be brought into direct contact. No preparation known to me will, however, remove the scales themselves from the trees, or in any way reveal to the unassisted eye the condition of the insects within. This can be ascertained only by microscopic examination of detached scales.

Time alone, and the condition of the tree itself, will indicate the result of an application. Kerosene, it is true, loosens the scales from the bark, so that, for a time, they are readily brushed off, but they afterwards become more firmly adherent, and are very gradually removed by the action of the weather.

Upon trees thickly infested a large proportion of the scales are so completely covered up by the overlapping of other scales or the webbing together of leaves by spiders and other insects, that the wash cannot be brought into direct contact with them, and they are only reached, if at all, by the penetrating action of the oil. This takes place gradually, and the number of bark-lice killed increases for some time after an application, reaching the maximum in the case of kerosene about the fifth day. In Long scale the oil penetrates the outer end, killing first the eggs at the broad and thin outer end, but its action is gradually exhausted and several pairs of eggs in the middle of the scale are often left alive. It is, therefore, impossible, in a single application, to destroy every scale upon an orange tree. This can, however, be accomplished by making two or three applications at intervals of four or five weeks. The mother insects being nearly or quite all killed by the first treatment, and the surviving eggs having in the interval all hatched, a second application, if thorough, will clear the tree.

The great difficulty experienced in reaching every part of the tree renders it absolutely necessary that any liquid used should be applied in fine spray and with considerable force. An ordinary garden syringe does not accomplish this and can never be used satisfactorily against scale insects.

The most effective instrument known to me, is the aquapult force pump. This throws a constant stream of moderately fine spray with such force that the fluid is driven into close contact with the bark, and on striking the leaves and branches is dashed into fine mist which envelops the tree and wets every leaf. The tree should always be sprayed from each of four sides, and rather more liquid should be used than seems necessary to drench every portion.

Although I have thought it advisable to recommend several applications, a single very thorough spraying with a good force pump will, in most instances, prove entirely effectual in clearing the tree, since, if only an occasional egg or coccid escapes, the great army of parasites and enemies will be almost sure to complete the work.

As has been already said, diluted kerosene does no injury to young growth or to the bark of the orange trees. It however causes the older leaves to drop, and, where the tree is badly infested with scale or otherwise out of condition, the defoliation is sometimes complete, especially if the wash is applied in the sun. The death of moribund branches and twigs is also hastened. Beyond this the injury, if such it be considered, is imperceptible, and dormant trees are invariably stimulated to push out new growth in two or three weeks after treatment.

Even in midwinter, if the weather is mild, sprouts will show themselves, and this is perhaps the only objection to its use at this season, for it is clearly not desirable to start the buds at a time when there is danger of frost.

During the past winter (1881-82) I have experimented with many young trees, using emulsions containing from 40 to 80 per cent. of kerosene, and in no case has any real injury resulted, although some trees, in very bad condition, have lost a portion of their twigs and smaller branches that had been long infested with scale, and were in a dying condition. In the spring, when the trees are in full growth and covered with tender sprouts, they may be sprayed with the diluted emulsion recommended above, without danger of checking their growth.

Soap.—The value of soap as an insecticide has long been known; and the experiments which I tried with it were made chiefly for the sake of comparison with those made with other substances. The results, however, were so remarkable that I feel warranted in saying that taking into consideration its efficiency as a means of destroying scale insects, its effect upon plants, and its cost, there is at this time no better remedy known than a strong solution of soap. In my experiments whale-oil soap was used, and the solution was applied by means of a fountain pump to orange trees infested with the red scale of California. In the strongest solution used the proportions were three-fourths pound of soap to one gallon of water.

The mixture was heated in order to dissolve the soap thoroughly; and the solution was applied while yet heated to about 100° F. The tree upon which the experiment was made was very badly infested, the bark of the trunk being literally covered with scales. Four days after the application of the solution I examined the tree very carefully and could find no living insect on the trunk of the tree, and only a small proportion of the coccids on the leaves appeared to be still alive. I was unable to examine the tree again personally, but three months later Mr. Alexander Craw, of Los Angeles, made a careful examination of this and some other trees upon which we had experimented, and on this one he was unable to find any living scale insects. Taking into consideration the extent to which this tree was infested, and the fact that but a single application of the solution was made, the result is remarkable.

In another experiment the solution was made as in the above and then an equal amount of cold water added. The tree experimented upon was similar to the one used for the former experiment. Four days after the application no living insects could be found on the trunk of the tree, and only a very few upon the leaves. In fact, the experiment was as successful as could be expected, it being very difficult to reach every insect on the leaves by a single application. When Mr. Craw examined this tree three months later he found but few living insects on it.

As a result of all of my experiments with soap, I recommend the use of it in the proportion of one fourth pound of soap to one gallon of water, repeating the application after an interval of a few days. If a cheap soap be used, which can be obtained for from four to six cents per pound, the cost of the remedy will not be great compared with what is to be gained.

NOTE ON CASTOR SEED.

Communicated by the Government of India, Agricultural and Revenue Department.

THE castor seed plant (*Ricinus communis*) belongs to the natural order of *Euphorbiaceæ*, and was originally a native of India, but now introduced into many parts of the world.

The Botanical description of the plant is thus given by Major Drury:—

Height 8-10 feet: root perennial: stem round, thick, jointed, channelled, glaucous, purplish red colour upwards; leaves alternate, large, deeply divided into 7 segments, on long tapering purplish stalks; spikes glaucous, springing from the divisions of the branches; the males from the lower part of the spike, the

females from the upper ; capsules prickly ; seeds oval, shining black, dotted with grey.

Cultivation.—In Upper India it is generally cultivated with other crops, but sometimes also alone. It forms a good hedge round the field, affording protection to the smaller crops inside the field from high winds. It can be grown almost on any kind of soil, although it loves a sandy loam and will not grow well on clays. Newly cleaned forest lands give an abundant outturn of castor seed. It does not require any special care besides the ordinary ploughing and manuring bestowed on the cultivation of barley, wheat, maize and other crops. Castor seed is sown twice during the year :—

- (1.) In March or April ; two or three months before the rains, when it is sown along with sugarcane.
- (2.) In July ; at the beginning of the rainy season, along with other rain crops.

The seed, after having been soaked in water for 12 hours, is sown with the hand one yard apart. If sown alone, 12 lbs. of seed are required for one acre of land. The crop does not require any further care, except watering if the land is too dry.

The fruit of the first sowing begins to ripen in November and continues to yield seed till March. The fruits are plucked by the hand, exposed to the sun, and when dry the seeds are separated from the outer shell. The fruit of the second sowing ripens in May. The plants are cut down after having borne for one year, as the second year's produce becomes inferior in quality as well as less in quantity.

Varieties.—Ordinarily two principal varieties of the seed are distinguished, one big and the other small in size. At the Calcutta market the big variety comes from Upper Bengal and the North-Western Provinces, while the smaller seeds come chiefly from the Madras Presidency. Many sub-varieties are distinguished locally, e.g., one called *chitkuá*, the fruits of which when ripe burst, throwing the seeds to a distance. The fruits are plucked before they burst. The fruits of another variety are plucked when green, put under cow-dung for a couple of days after which they are dried in the sun. This process is said to increase the proportion of oil.

Outturn.—The yield when sown with other crops is 3 to 4 cwts. per acre.

Extraction of oil, home process.—Cultivators generally extract oil at home for burning in lamps. The process is as follows :—

- (1.) Seeds partially roasted on heated sand put in a pan over a fire which coagulates the albumen and liquifies the oil.
- (2.) * Slightly crushed by a hand-mill and husked.
- (3.) Pounded in a mortar.

- (4.) Boiled in water; 2 quarts of water being added to 5 lbs. of pounded seeds.
- (5.) As the water evaporates, the oil rises to the surface, when it is taken out with a spoon and put in a separate vessel.
- (6.) The oil thus obtained is boiled again, by which process the sediment, the remaining moisture and all other extraneous matter is burnt up or precipitated, and the oil becomes more purified.

The oil thus obtained is, however, still very impure, thick and viscid; and offensively smokes when burnt in lamps. It is also used to anoint shoes, water bags used for raising water from wells, and other agricultural appliances made of leather. The yield of oil is 33 per cent. of seed.

Scientific process.—The oil extracted with the aid of scientific appliances, hand-mill or hydraulic press is of a superior quality. The following method of extracting oil, described by Lieutenant Hawkes in his Jury Report of the Madras Exhibition, is the general way followed by exporters of castor oil:—

The fresh seeds after having been sifted and cleaned from dust, stones, and all extraneous matters, are slightly crushed between two rollers, freed by hand from husk and coloured grains, and enclosed in a clean gunny. They then receive a slight pressure in an oblong mould, which gives a uniform shape and density to the packets of seed. The "bricks," as they are technically called, are then placed alternately with plates of sheet iron in the ordinary screw or hydraulic press. The oil thus procured is received in clean tin pans, and water in the proportion of a pint to a gallon of oil being added, the whole is boiled until the water has evaporated; the mucilage will be found to have subsided and encrusted the bottom of the pan, whilst the albumen solidified by heat forms a white layer between the oil and the water. Great care must be taken in removing the pans from the fire the instant the whole of the water has evaporated, which may be known by the bubbles having ceased; for if allowed to remain longer, the oil, which has hitherto been of the temperature of boiling water or 212° , suddenly rises to that of oil or nearly 600° , thereby heightening the colour and communicating an empyreumatic taste and odour. The oil is then filtered through blanket, flannel, or American drill, and put into cans for exportation. It is usually of a light straw colour, sometimes approaching to a greenish tinge. The clean seeds yield 47 to 50 per cent. of oil.

Messrs. Khettra Mohan Bysacks, one of the leading castor oil manufacturers in Calcutta, whose oils, marked K.B. 1, K.B. 2, and K.B. 3, are largely exported to Europe and Australia, and who have won a first class order of merit at the Melbourne Ex-

hibition, have furnished the following information on the subject :—

They generally use the big Bengal and the small Madras seed.* The price at Calcutta for

* Samples sent by Parcel post. both is about 6s. per cwt. The proportion of oil yielded is 40 per cent. by the former and 37 per cent. by the latter, but the latter is said to yield the best kind suitable for medicinal purposes, while the oil from the former is chiefly used for burning in lamps and for other purposes. They manufacture four kinds of oil, distinguished according to the degree of refinement :—

I.—Cold-drawn, the best kind, only used in medicine.

II.—Cold-drawn, No. 1, used in art and manufacture.

III.—Cold-drawn, No. 2, less refined, used as above, and also for burning in lamps.

IV.—Cold-drawn, No. 3, unrefined, used for burning and in machines.

Hydraulic press is not used; as its unsuitability has been found by experience to lie in the difficulty to adjust the amount of power bestowed in the different stages of pressing. A hand-mill is used, which is said to have been invented by Messrs. Jessop and Co. at the early stage of Indian castor oil trade with foreign countries. The machine has not been patented. The process followed by this firm is described below :—

For I.—The seeds are first cleaned with the hand; women are employed in this work. They place a quantity of the seed on a smooth board, to which they give one or two strokes with a flat wooden mallet which breaks the seed to two or three pieces, thus rendering the separation of the husk easy. The broken seeds are then winnowed with a common basket winnower, which removes the husk from the kernel. The kernels are then dried in the sun and then broken by a crushing machine. They are then put within small canvas or gunny bags, and then pressed in the hand-machine, the oil falling in a pan placed underneath. The oil is then collected in large galvanised iron vats and bleached by exposure to the sun, which also causes the sediment to precipitate. It is then boiled in order to evaporate any remaining moisture. Vegetable charcoal is then added to it, and the oil is then thrice filtered through flannel or blotting paper. The oil thus obtained is of the purest quality, only used in medicine, and manufactured only on order. No fire is applied during the pressing, and hence no irritating part of the seed finds its way to the oil. The yield is, however, 10 per cent. less than II.

For II.—The seeds are husked, crushed and pressed as before. At the time of pressing, fire is put underneath the machine, the heat from which liquifies the oil and increases the yield, with which, however, a certain proportion of the irri-

tating or injurious part of the seeds is mixed, which is avoided in I. It is then bleached and boiled as before, and filtered with the addition of animal and vegetable charcoal. This kind of oil is also not ordinarily manufactured.

For III.—Process as above, but not filtered. Largely manufactured and exported. Price 30s. per cwt.

For IV.—The seed is not husked by the hand, but by machine, and is therefore not quite free of husk, and the oil not so clean. Other processes as in III. Not filtered. Price 25s. per cwt.

The proportion of oil ordinarily obtained by the different processes has been mentioned above. The following figures give the actual results obtained by experiments made at Calcutta and Madras with the object of ascertaining the percentage of oil in the castor seed.

In Calcutta 1,400 lbs. of seeds (which gave after husking and cleaning 980 lbs. of kernel of three sorts) were pressed with the following result:—

	Kernels.			Oil obtained.	
	lbs.	lbs.	lbs.	lbs.	lbs.
1st sort	632	...
2nd sort	184	...
3rd sort	164	...
				980	...
					488

1,400 lbs. of seed yielded 488 lbs., or about 35 per cent. of Oil.

In Madras the same quantity of seed yielded the following quantities of Oil.

	Oil obtained.	
	lbs.	lbs.
1st sort	...	318
2nd sort	...	88
3rd sort	...	74
		—
	480 lbs., or a little above	
		34 per cent.

LIST OF MEMBERS

OF THE

Agricultural and Horticultural Society

OF

INDIA.

DECEMBER 31st, 1884.

ALPHABETICALLY ARRANGED,

CLASSIFIED,

AND

DISTINGUISHING THE YEAR OF ADMISSION.

Patron.

HIS EXCELLENCY THE MOST NOBLE GEO. FREDK. SAMUEL, MARQUESS OF RIPON, K. G., P. C., G. C. B., VICEROY AND GOVERNOR-GENERAL OF INDIA.

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A—(Continued.)

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Assistant Manager, Ting Ling Tea Co., Darjeeling	1875
Assistant Manager, Singbuli and Nurmah Tea Co., Limited, Darjeeling	1875
65 Azimuddin Khan, General, Rampore Estate, via Moradabad	1883

B:

BAILLIE, Duncan J., Esq., c. s., Assistant Commis- sioner, Partabgurh, Oudh	1884
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B—(Continued.)

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D.

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E.

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G.

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G—(Continued.)

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L.

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M.

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Mackinnon, John, Esq., Merchant, Calcutta	...	1875
Mackintosh, A., Esq., Bassopally, <i>vid</i> Sewan, Sarun	...	1879
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270 Maharajah of Munipore, K. C. S. I., <i>vid</i> Cachar	...	1884
Maharajah of Rewah, H. H. The, Sutna	...	1884
Maharajah (Coomar) of Vizianagram	...	1879
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Manager, Awah Estate, Awahgurh, Agra District	...	1879
275 Manager, Baghdogra Tea Estate, Silligoree	...	1884
Manager, Balasun Tea Company, Darjeeling	...	1875
Manager, Bengal Tea Company, Cachar	...	1867
Manager, Bisnath Tea Company, Assam	...	1875
Manager, Blackburne Tea Garden, Assam	...	1881
280 Manager, Borelli Tea Company, Assam	...	1873
Manager, Brahmapootra Tea Company, Assam	...	1875
Manager, Boromcherra Tea Garden, Cachar	...	1876
Manager, Bowreah Cotton Mills Company, Ltd.	...	1883
Manager, Burhoga Factory, Sarun	...	1884
285 Manager, Central Cachar Tea Company	...	1875
Manager, Central Terai Tea Company, Darjeeling	...	1875
Manager, Chenga Tea Association, Darjeeling	...	1875
Manager, Chumta Tea Association, Darjeeling	...	1875
Manager, Chunderpore Tea Garden, Assam	...	1875

M—(Continued.)

		<i>Admitted.</i>
290	Manager, Chundypore Tea Company, Cachar	1862
	Manager, Cutlee Cherra Garden, Cachar	1865
	Manager, Dahingapore Factory, Assam	1865
	Manager, Darjeeling Tea and Cinchona Association, Darjeeling	1879
	Manager, Debrooghur Divn., Upper Assam Tea Co., Assam	1881
295	Manager, Goosery Cotton Mills Co., Ld., Goosery	1884
	Manager, Gouripore Co., Limited, Nyhatta	1884
	Manager, Durrung Tea Company, Assam	1877
	Manager, Dewkonall Estate, Cuttack	1871
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	Manager, Equitable Coal Company, Ld., Seetaram- pore	1882
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	Manager, Greenwood Tea Garden, Assam	1875
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OF THE

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JOURNAL
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Agricultural and Horticultural Society
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INDIA.

PHYLLOANTHUS RETICULATUS.

IN my "Note on the trees in the Sonthal Pergunnahs deserving special protection," published in the Journal of the Agricultural and Horticultural Society of India for 1884, Vol. VII., Part II., I mentioned among the uses of *Diospyros Embryopteris*, *Pers.* that the ashes of a small shrub known in the Dacca district as *Sitki* were mixed with the *Gaub* liquor for paying boats. Since then Mr. Gamble has kindly favoured me with the botanical name of this shrub as *Phyllanthus reticulatus*, *Poiret.* Syn.—*P. multiflorus*, *Roxb.*

As the only mention of this shrub by Dr. Watt in his "Economic Products of India" is under the head of Timbers, I beg to give some other uses which may be new to some of your readers.

The reasons why the charcoal of this shrub is used in preference to any other in the paying of boats, are that it is reducible to an extremely fine powder, it produces a deeper and more lasting black than any other native known substance, and forms with the *Gaub* liquor a very strong waterproof cement in the crevices of the decaying wood. The proportion of charcoal powder to *Gaub* liquor is in bulk about one to four for very old boats, and less according to requirements for new.

The charcoal is made in the ordinary native method, and reduced to powder with the *Denki* or in an *Okki*.

The charcoal of this shrub is also considered much superior to any other for making the small charcoal cakes called *tika*, used by the natives for lighting the Hooka, as it burns steadily until completely consumed.

The fruit, which is a small black berry, is used by the villagers of these parts for dyeing their clothes a purple, the color is at first deep and bright, but is fleeting ; I have tried to fix it with proto-sulphate of iron, and with alum, the former however changes it to various shades of slate, and the latter to light shades of blue.

The wood, as Dr. Watt says, is white or greyish white, hard and close grained, but as the stem never reaches more than 12 or 15 inches diameter and is short and crooked, it could only be useful for very small articles.

Drury also gives the following uses of this shrub :—" The root, which is sold in the bazars, is about a foot long and two inches thick, dark outside, and sweetish tasting. It is considered alterative and attenuant, and is given in decoction, about four ounces or more twice daily. The bark is used for dyeing a reddish brown."

NARAINGUNJ,
4th September 1881. }

C. F. MANSON.

NOTES ON VANILLA,

Contributed by T. LANGLOIS, Esq.

CULTIVATION.

THE cultivation of the plant differs a little according to the climate, but every where great care and attention are required.

Where it thrives well the best support on which to train the plant is the Pignon d'Inde (*Jatropha curcas*, or Physic Nut) other supports, however, can be used, the creepers are some-

times trained even on cross-bars, but in any case care must be taken not to allow them to choke each-other and prevent free ventilation. Moderate shade is required, just enough to prevent the plants getting scorched by the sun.

Propagation.—The soil must be light; four, five or six knots of the creeper are put under ground, taking care to cut off the leaves attached to them. After fifteen or twenty days when the cutting has well taken root, straw is placed round the foot of the plant and this is also about the best manure.

In Seychelles cuttings may be planted at any time of the year (as the seasons do not differ); elsewhere it would be better to plant them during the rainy season. Care must be taken that water does not stagnate on the spot chosen for the cultivation of Vanilla, but the wash should not be so great as to wash away the manure required.

It is especially when in flower that the creepers require to be well fed. At this time generally the plants that have blossomed are well looked to, and if the creepers are only held by one or two suckers they are very carefully lowered down and put in the ground. Straw is then plentifully scattered, and the plant is well watered, several times when the weather is dry.

Vanilla plants do not generally require animal manure. However, if the soil is poor or if the creepers have suffered through exhaustion, manure may perhaps be used. In such cases it should be employed in moderation in the following proportions: $\frac{1}{3}$ manure, $\frac{1}{3}$ sand, and $\frac{1}{3}$ earth, well mixed together.

Practice will teach the rest.

PLUCKING AND PREPARATION.

According to Mr. Deltail's Process.

Gathering of the Pods.—The gathering of the pods begins towards the second half of May and continues until August. The first pods are generally inferior, those that are gathered in June give a better produce.

It is very important to pluck the pods only when they have attained the required degree of maturity, otherwise they ferment and rot a few months after being prepared.

There are certain signs which indicate with certainty when the pods are in a state to be gathered. For instance, the thick end of the pod turning yellow, is one.

Fine settled weather must be chosen in which to harvest the pods, as the day after plucking they must be exposed to the sun.

Preparation with boiling water.—As soon as the water is nearly boiling, but not quite in ebullition, at the temperature of 185° to 190° F., the baskets containing the pods are dipped for fifteen to twenty seconds, and this operation is not repeated. Some times the baskets are dipped in and taken out slowly from the water two or three times, remaining three or four seconds each time in the water.

After each basketful has been thus dipped, it is emptied on tables arranged for the purpose or on mats, to allow the water to drain off. When all the pods have been sealed, they are placed in heaps then covered over and allowed to foment for a quarter of an hour.

Sunning.—They are then spread on tables, covered over with blankets and exposed to the action of the sun for some time.

They are then rolled up in the blankets which were used for sunning them, and taken into a closed room in which they remain warm till the next day.

They may also, after each exposure to the sun, be kept in boxes lined with blankets, where they retain their heat better during the night.

This exposure to the sun in blankets continues from four to eight days, according to the weather. Care is taken to look often at the pods, and to take out those that have come to the stage when the sun might injure them. The pods have attained that degree when they become tender and the epider-

mis of a chocolate brown colour appears empty with longitudinal fissures.

A too long exposure to the sun gives a produce that is dry, reddish, little aromatic and less appreciated in the trade.

Drying place.—The pods are then taken to the drying place, a well closed house with a western exposure, having windows all round which are opened in the middle of the day when the sun is strong. Internally the room has shelves all round, made of battens about $\frac{3}{4}$ inch thick, and at distances of five inches one over the other to allow of free ventilation.

These shelves must be of open or rattan work.

The pods placed on these shelves remain there for thirty to forty days, until they attain the required degree of desiccation. They require to be constantly looked after. The more advanced pods must be separated from those that are less so.

The proper degree of desiccation is ascertained when by taking the pod by one end between the thumb and the fore-finger of the left hand, and running the thumb and fore-finger of the right hand along the whole surface of the pod, no rugosity is felt. At that time the pods are black, tender and wrinkled; they flatten more easily and the sensation to the touch is not so cool.

Tin Boxes.—Lastly when they are considered quite dry, they are put in closed tin boxes to prevent further desiccation which would be prejudicial. They remain there until they are to be put up in bundles. Care is taken to look at them once a week in order to take out the pods that get mildewed.

The preparation by this process requires at least two months.

It is calculated that the pods lose $\frac{1}{4}$ of their weight and that five kilos of green pods are required for one kilo of dry Vanilla.

Before putting up the pods in bundles they have to be straightened and picked.

Straightening.—The pods are straightened one by one by pulling them gently on the side opposite to that in which

the pod is bent, the two ends being held between the thumb and the fore-finger of each hand. The object of this preliminary operation is to give a better shape and bring the pods back to their normal length.

Sorting.—They are then sorted into three qualities:—

The FIRST, is composed of pods quite unctuous, well perfumed, black and without defects.

The SECOND, of pods too dry, somewhat reddish and having rugosities on the epidermis.

The THIRD, of split pods.

These three sorts of pods are placed in different boxes.

There still remains three operations the pods have to go through.

Measuring.—For the measuring a table is used, on the edge of which has been marked a scale graduated from 0 to 9 inches.

From the 5th to the 9th inch, 25 gradations are marked, 2 lines (about $\frac{1}{4}$ inch) apart. The gradation marked at the 5th inch has the No., 1, and that at the 9th inch the No., 25. On this same table are 12 transversal compartments, forming two rows of six compartments each; the one in the nearest row to the left of the table has the Nos. 1 to 13, the next Nos. 2 to 14, and so on to the 12 which has the Nos. 12 to 24.

The measurer sitting at the table and having near him the box of prepared Vanilla, that is already sorted in qualities, has only to measure the pods and put them in the cases, corresponding to the numbers of the measure on the table. When the boxes are full, provisional packets of 50 pods are made tied in the middle with a piece of robbin reed.

Putting up in Bundles.—To put up finally in bundles, the provisional bundle of 50 pods is taken, and the 16 finest ones are chosen and put aside to be used as the covering around. From the 34 remaining pods, eight of those that

are the most straight are taken to form the middle. The pods are then well arranged all round, the concave part being turned towards the centre and all the pods placed the one against the other. The 16 exterior ones being placed the one close to the other, so as to form an envelope surrounding hermetically the centre pods, they are fixed by a piece of robbin reed going twice round the bundle and tied with a flat knot a little lower than the middle of the bundle. There only now remains to examine well the end of the bundle, knocking it gently by the lower end on the table so that the thick ends might be on the same level, and the bundle might be able to stand by itself, then a second tie is put round at one centimetre (about $\frac{1}{2}$ inch) from the end of the thick part and another one at two or three centimetres (about $\frac{3}{4}$ to 1 inch) from that of the stock ends.

Packing.—When all the bundles are ready, well pressed and straightened, they are measured a second time on a scale graduated by $\frac{1}{2}$ inches, and packed in rows according to their lengths in tin boxes of different sizes, containing each ten to twelve kilos of Vanilla.

The boxes must not contain any paper or lining of any sort that could be prejudicial to the good keeping of the pods. The boxes are then soldered and labeled each with a number to indicate the different commercial qualities. These tin boxes are afterwards packed in wooden cases containing each three tins, that is, 30 to 40 kilos of Vanilla.

Commercial qualities.—1. Vanilla pods of 0m. 20 length and more, of dark chocolate colour with quite smooth epidermis, weighing 0k. 300 to 0k. 330 per bundle of 50 pods.

2. Pods slightly woody, reddish, drier, mixed with split pods, weighing per bundle 250 to 270 grammes.

3. Vanillons (small pods) of the smallest lengths and of inferior preparation, weight of bundle 70 to 150 grammes.

A modification in the process is to place the pods in black woollen blankets on tables and leave them so for eight or

ten consecutive days. They are then prepared and can be despatched at once.

The blankets with the pods in can also be placed on tables covered with tin ; the minimum heat obtained is 50° C.

PREPARATION WITH THE OVEN.

After the gathering, the pods are carefully wiped and separated as much as possible into heaps of the same length. Bundles of 1,000 pods each are made by horizontal layers, alternating the thick and the stock ends to keep them on the same level. Each bundle should be 50 centimetres (about 20 inches) long, the other dimensions depending on the length and thickness of the pods.

Each bundle is then wrapped up in an old woollen blanket, carefully folded, then surrounded with green plantain leaves ; lastly it is sewn in a single gunny cloth previously wetted and rinsed.

Small wooden hurdles of the required size are prepared to receive each bundle, so as to isolate it from the immediate contact of the oven which would be injurious.

After heating the oven, the coal and ashes are taken out and it is allowed to cool. This is the delicate part of the operation.

The degree of temperature which is to be taken may vary from 50° to 75° C. according to the qualities of the oven or the size of the pods, the number of bundles to be put in and the time they will remain in the oven.

Trial and experience will fix the rule for each person. It is, however, important, in order to regulate the temperature of the oven at which one wishes to begin the operation, to place in the oven, on a small wooden trestle a thermometer and to close the oven hermetically for ten minutes.

When the heat will have been well regulated, the bundles will be put in on the hurdles, taking care to put in first the largest pods and lastly the smallest. They are placed apart so that they will not touch one another and the door of the oven is closed.

The bundles containing the smallest pods can be taken out after 24 hours and the others after 36 hours.

This should be done as much as possible during the day time so as to take advantage of a few hour's sunning.

On taking them out of the oven the pods should have a fine and uniform pure colour.

They are wiped with care and then put in the sun between two blankets every day from $9\frac{1}{2}$ to $2\frac{1}{2}$ o'clock.

They are taken out of the sun when the pods do not offer any resistance to the pressure of the fingers. They are then taken to the drying room, and the rest of the preparation and packing is carried on as already detailed.

REPORT ON SILOS IN MYSORE.

CONTRIBUTED BY MAJOR-GENERAL SIR H. T. MACPHERSON,
V. C., K. C. B., &c.

BANGALORE, 15th September 1884.

From COLONEL A. C. HAY, Offg. Military Secretary, Mysore,
to the Secretary to the Dewan of Mysore.

SIR,—I have the honor to submit a report of two experiments made with silos at the Mysore Government Stud Farm at Kunigal—one being an underground silo, and the other a pile of freshly cut forage under an open-sided shed, weighted with stones in the manner described by M. Houles, by whom the method was successfully tried in France.

The underground silo was excavated in dry gravelly soil with no plastering of any kind, but protected from rain by a light thatched roof supported on forked posts. The dimensions were—

Length	...	...	...	16 feet.
Breadth	...	...	...	11 "
Depth	...	...	...	10 "

with a gradual slope of four inches from top to bottom, the cubic capacity being 1,715 cubic feet.

Work was commenced with the silo early in the morning of 28th December last, when the grass in paddock No. 1 was mown with scythes, and as it was cut carted off and deposited in the silo. Before packing the green grass a layer of paddy straw was placed at the bottom of the silo to keep out any damp, and the grass was then laid on it to a depth of three feet, great care being taken to have the four sides well trampled down by women coolies. As it was determined to try the effect on different descriptions of forage, the following layers were successively packed and trodden down :—*harriāli* grass at the bottom, followed by intermediate layers of chaffed oats, sorghum, *harriāli* grass, chaffed sorghum, and *harriāli* with a final layer of chaffed sorghum. On this was spread a layer of paddy straw three feet thick, and a platform made of the branches of the *hongay* tree was laid on the top and weighted with large rough rubble stones. The work was finished on the 24th January, three days being occupied in weighting, &c. The silo was opened on the morning of the 16th August, seven months having elapsed since it was closed, and the mass having sunk four feet in the interval. I had no apparatus for forcing down a thermometer to a greater depth than three feet below the surface, but the temperature at that depth was 96° , or 14° higher than that of the air, which was 82° under cover of the shed. When opened the top layer of sorghum was a dark-brown color, warm and damp to the touch and containing so much moisture that on pressure a reddish juice exuded at once. The *harriāli* grass was not so moist, but was appreciably damp and looked like inferior hay. The vinous smell from both was most overpowering, and at the edges of the silo the forage was of a different color and emitted a very offensive smell.

A cubic foot of the ensilage was cut out at 1 P. M., when it weighed 21lb, and on being weighed again three hours after it had lost 3lb by evaporation under a strong wind.

In the course of the afternoon 56 cubic feet were cut

out evenly from top to bottom at one of the corners, the contents being so consolidated that it required two men using a sharp spade-shaped steel knife to do it.

The mass weighed 1,099lb or 22lb per cubic foot, and the stones on being weighed were found to be 31,360lb in weight, giving a pressure of 178lb per square foot.

Some of this forage was at once given to the farm cattle, which ate it with avidity, and it was with one or two exceptions readily eaten by all the horses to which it was offered. On the following day the vinous smell had passed off and was succeeded by an offensive odour which gradually subsided when the forage was loosely spread out, and when I left Kunigal it was being consumed by the farm cattle.

A cubic foot of the harriāli grass was brought into Bangalore and is now quite dry and much like inferior hay, except that it retains rather a peculiar smell.

Cattle and horses eat it at once when given to them.

The pile of forage treated on M. Houle's system consisted of green lucerne and Guinea-grass cut on the morning of 27th January. On that date a quantity of this was cut and packed under an open thatched shed of the same kind; on the 28th more was added, and on the evening of that day the pile was covered in and weighted with stones.

The dimensions before weighting were—

	<i>Feet.</i>	<i>Inches.</i>
Height	5	8
Length	7	0
Breadth	7	6

but in the course of a month the mass had sunk to within 1½ feet from the ground.

On being opened it was found that the top and sides were entirely decomposed and smelt abominably, but by gradually cutting away the outside portion, it was ascertained that a portion in the centre was very well preserved. The lucerne was of a dark brownish green, moist and warm,

without much smell, and readily eaten by the cattle.

On the 16th August a cubic foot of this ensilage weighed 42lb, and on the 18th 40lb showing a loss of 2lb by evaporation, the pressure having been 105lb per square foot.

A cubic foot was brought into Bangalore, and when examined a week, after the centre of the block was still slightly heated, the thermometer showing 83° against 79° which was the temperature of the room at the time.

These experiments are useful, but in the case of the underground silo the work was not carried out exactly in accordance with my instructions, and the result did not appear at the time as satisfactory as was expected.

This silo took a much longer time to fill than was anticipated, and the stones used for weighting were, through a misapprehension of the orders, not covered with earth. The weight both on this silo and on the other was unequally distributed, so that a uniform pressure was not imposed on the whole mass.

The filling of the underground silo was in fact accidentally carried out somewhat in the manner described in a paper in the *North British Agriculturist* by Mr. G. Fry, F. L. S., Chobham, headed "The Production of Sweet Ensilage" in which case the product is said to possess all the characteristics of hay, except that it is moist instead of dry.

The cavity from which a portion was taken out was filled with earth at once and closed, as it was considered best to reserve the remaining portion for a further trial.

I returned to Kunigal on the 8th instant, accompanied by Colonel Magrath, the Commissary-General, who was anxious to see the silo, which was re-opened on the morning of the 9th in our presence, and a large portion cut out for examination.

It was most satisfactory to find that all offensive odour had disappeared. The vinous smell was not nearly as strong.

A half-inch gas pipe was driven down to the centre of

the mass, and the temperature as shown by a thermometer lowered down the pipe was apparently 29° centigrade, equal to 84.5° Fahrenheit. It, however, rose in 10 minutes to 32° centigrade, equal to 89.5° Fahrenheit, and the actual temperature of the fodder when the thermometer was brought into direct contact with it in the centre of a block was 40° centigrade, equal to 104° Fahrenheit.

Two cubic feet of the harriàli grass were cut out and each cubic foot weighed separately, with the following results :—

No. 1 at 11-30 A. M. weighed ...	...	...	22lb.
" 1 " 2-30 P. M. "	...	...	18 "
" 2 " 11-30 A. M. "	...	...	22 "

Spread out and dried as hay weighed 13lb having lost 9lb by drying.

The harriàli grass was slightly discolored with white mould at the edges and for about an inch or two of the surface, otherwise it was moist, sound, and sweet, and was eaten greedily by cattle as well as by the horses.

The chaffed sorghum contained more moisture, but was in admirable condition, and was eaten readily by all the animals except one or two. In some cases they left the green grass which they were eating and took the ensilage in preference.

Colonel Magrath and myself were entirely satisfied with the success of the experiment, which has shown clearly that green forage can be stored and preserved with less difficulty and labor than hay.

The experiment with the surface silo showed that green lucerne and Guinea-grass were more easily compressed than harriàli; and from the condition of the lucerne in the centre, I have no doubt that if the forage had been in an under-ground-air tight silo, the whole would have been in excellent condition.

The pressure in both of these silos does not, however, appear to have been nearly as great as is recommended

elsewhere, and it might apparently be increased with advantage to 300lb per square foot, the weight being calculated and arranged previously instead of being, as in this case, put on by guess.

There seems to be no necessity for cutting up grass, lucerne, or Guinea-grass; but the chaffed sorghum was found to be a very convenient form for giving it to animals. As required, quantities were at once lifted out and carried away in baskets.

A point on which also I entertain no doubt is, that in practice it will be found better to have a number of silos of a comparatively small size than a few large ones. It is impossible to fill, weight, and close a large silo without great delay and interruption, and the carriage of the grass from a distance adds to the trouble and expense.

The trials to be made in the Amrit Mahal Kawals will, therefore, be with silos of the dimensions recommended by Sir Herbert Macpherson, who has very kindly given me much information on the subject, and who has shown by his own experiments that the most convenient and easily filled silo contains the grass of from 2 to 6 acres cut from the land immediately surrounding the silo.

FIBRE MACHINE TRIALS.

As there has been a great and wide spread interest taken in the fibre-machine trials recently held in Calcutta, the Government Resolution and Report in connection therewith are given *in extenso*.

*Revenue Department, Miscellaneous (F.) Darjeeling, the
5th September 1884.*

RESOLUTION.

READ—

Letter No. 641Ex., dated 24th June 1884, from the Secretary to the Government of India, Revenue

and Agricultural Department, to the Secretary to the Agri-Horticultural Society of India.

Letter No. 817Ex., dated 30th July, from the Secretary to the Government of India, Revenue and Agricultural Department, to the Government of Bengal.

Letter No. 829Ex., dated 5th August, from the Secretary to the Government of India, Revenue and Agricultural Department, to the Government of Bengal.

During the recent Calcutta Exhibition, trials were made, at the suggestion of the Government of India, of certain fibre-extracting machines then in the Exhibition. Partly owing to the difficulty of procuring all the fibres which it was desired to test, and partly from the defects of the machines then available, no conclusive results were arrived at. It is now proposed to renew the experiments under more favourable conditions, with the assistance of the Agri-Horticultural Society of India, which has been asked to supply the requisite fibres. The objects in view are—

- (i.) To secure such a competitive trial of machines and processes for the extraction of Indian fibres as may lead to the introduction into this country of a cheap, simple and portable fibre-extracting machine.
- (ii.) To obtain the opinion of experts in India and in Europe as to the value of the fibres obtained by the trials, and the uses to which they can be put.

The experiments will be carried out in Calcutta on the 15th October and following days, under the management of Mr. J. W. Hanlon, Superintendent of Jail Manufactures, assisted by Mr. Liotard, of the Revenue and Agricultural Department of the Government of India, whose services have been placed at the disposal of this Government with effect from the 15th September. Stems and other fibrous portions

of fibre-bearing plants or trees, and as far as possible motive power, will be provided by Government. Intending competitors are invited to place themselves in communication with Mr. Hanlon at the office of the Inspector-General of Jails not later than the 1st October next, and to state on which fibrous plants they wish to experiment, and to what extent, in order that arrangements may be made for providing sufficient quantities of material to be operated on.

If the number of machines entered is sufficient to produce a satisfactory competition, the Government will be prepared to award a sum of Rs. 2,000 in prizes, the respective amounts of which will be subsequently determined.

ORDER.—Ordered that this Resolution be published in the *Calcutta Gazette*, and that copies be forwarded to the Government of India, Revenue and Agricultural Department, the Agri-Horticultural Society of India, the Superintendent of Jail Manufactures, and Mr. Liotard, for information.

A. P. MacDONNELL,
Secretary to the Government of Bengal.

REPORT OF THE COMMITTEE.

To the Secretary to the Government of Bengal, Revenue Department,—Calcutta, the 24th November 1884.

SIR,—We have the honour to report on the competition of machines in the extraction of fibres. Nine machines were entered for competition. These will be described briefly in the order in which they were placed in the shed erected for the purpose of the trials.

I. A machine patented by Monsieur Berthet and constructed by Messrs. Talpin frère et cie of Rouen. This machine was brought to Calcutta by Sir Walter deSouza and entrusted to Dr. King, Superintendent of the Royal Botanical Gardens, Howrah. It is a large machine, rather straggling in appearance, and of ingenious, though not very efficient, mechanism

The principal parts are a couple of large drums carrying gun-metal scrapers. To keep the plants up to the scrapers each drum is fitted with an adjustable curved wooden block. The plants in the first place are fed to a set of rollers which operate upon the whole length at once, that is, the stem is placed parallel with the rollers. As the rollers are only about 4 feet long, most of the plants had to be cut to suitable lengths. After passing through the crushing rollers an endless wire rope carries the crushed stems to the beaters. First, one half is scraped at one drum, the cleaned end is then picked up by the endless rope, and the other half is carried past the other drum ; finally, what is left is removed automatically from the rope before the latter passes again to the crushing rollers. This feeding arrangement did not work with any certainty. The cost of the machine is unknown.

II. A machine invented and patented by Mr. R. R. G. Hatti Borooah, a native gentleman of Upper Assam. This is a simple mechanical arrangement, consisting of two pairs of smooth wooden rollers on iron spindles set in a line in a vertical frame. A spur wheel is geared to both sets of rollers, and motion is communicated through a set of bevel wheels by a horizontal shaft carrying the usual fast and loose pulleys. The machine is faulty in design, and is said to cost Rs. 300. Stems are passed through the rollers several times, and washed nearly as often, until clean fibre is obtained.

III. An apparatus by Mr. Hatti Borooah, worked by manual labour. This consists of two smooth rollers about 2 feet in length and 6 inches in diameter, placed upright and worked by iron spur wheels put in motion by a central shaft, to which motion is communicated by a wooden lever 10 feet long turned by two men. In construction this apparatus is identical with the ordinary native sugar mill, and is said to cost Rs. 50.

IV. Pownall's Patent Flax scraper, constructed in Wellington, New Zealand, and sent out to the care of Messrs.

Heilgers & Co., of Calcutta. This is a very compact little machine, driven by steam-power. It consists of a pair of horizontal grooved iron rollers, placed at the centre top of the machine. Immediately below these rollers are two drums provided alternately with scrapers and flat-faced iron ribs. Below these drums are two smooth rollers of the same size as the upper grooved ones. The fibrous stems, when put to the grooved rollers, are drawn in and crushed, and then forced between the drums, where, by the action of the scrapers of one drum against the alternate flat bar or rib of the other, the woody part and refuse matter are scraped off. The fibre dropping between the lower smooth rollers is held firm and is brought out underneath the machine. The cost of the machine is unknown.

V. A smaller machine of an exactly similar description by the same owner. This is workable by hand or steam-power. Price unknown.

VI. Another small compact iron machine on the same principle as Nos. 4 and 5, and by the same owner. There is, however, this difference in this machine, that the drums are made of thin plate iron, and so constructed as to ensure a certain elasticity when the scrapers come in contact with one another as the stems are passing through.

VII. A small machine belonging to the same owner as the three last mentioned. This is workable by either manual labour or steam-power. Two small grooved iron rollers crush the stems and push them forward between a wheel four feet in diameter provided with scrapers, and a zinc frame in close adjustment with the scrapers. The stems having been crushed by the rollers, the action of the scraping wheel against the zinc frame removes refuse matter from the stems, and brings the latter between two smooth rollers at the bottom, whence the fibre is taken out.

VIII. Cantwell's Patent process for extracting fibre-bearing plants. The patentee describes his process thus, using for

this purpose a roll mill patented by him for the expression of sugar-cane juice : " My patent sugar-cane mill is modified for this purpose (extraction of fibre) by the insertion of a spring or other elastic substance at the back of the crusher or bearings so as to prevent the fibre in the plant from being crushed or ground in the process of crushing. This can be done in a few minutes by removing the rigid abutment piece used when crushing sugar-cane and substituting for it the spring. The crushing process is primarily intended for endogenous plants that cannot be retted, but exogenous plants are simply crushed one or more times and then retted in water for a short period, varying from two to four days, according to the amount of crushing the plant may have received. The exogenous plants having hard woody centres are first crushed, then the fibre part peeled off and again passed through the mill, and then retted for from 24 to 48 hours."

IX. The universal fibre-cleaning machine, invented by Mr. H. C. Smith, manufactured and improved by Messrs. Death and Ellwood of Leicester, and brought to public notice by the General Fibre Company of London, is a very simple, compact, and well-designed machine. It consists of a cast-iron drum, perfectly balanced, on which eight gun-metal beaters are bolted. The drum revolves in front of a table or feed-plate fixed below the centre of the drum so as to give a scraping action when the beaters pass it. The feed-plate is adjustable to and from the beaters by set screws, so that a fine or thick fibre can be cleaned. Immediately below the feed-table is a jet pipe which throws a strong thin flat sheet of water against the whole width of the drum. These are the essential parts of the machine, and they are mounted on a cast-iron frame, which carries them as well as a trough to receive and let out water, refuse and waste, and to prevent the water being thrown about. Two men feed the machine ; each taking from three to five leaves or stems at a time, places the thick ends upon the feed-table and pushes them against the revolving

drum provided with beaters. These smash the woody parts of stems, disengage the pulpy matters of leaves, loosen all refuse matter, and by their action draw the crushed stems or leaves under the drum : here the sheet of water presses the stems or leaves against the beaters, a beating and scraping action continues, and the sheet of water acting as a cleanser as well as an elastic cushion or backing to the fibre while it is struck by the beaters, ensures a thorough cleaning. The stems or leaves are allowed to pass half way into the machine, and when withdrawn all extractive matter has gone and clean fibre is obtained. This is held in the hand of the operators, who then pass and withdraw the thin ends in the same way. The result is clean pure fibre which is then hung up to dry, and when dry is ready to be baled at once. The cost of a single machine is £55, that of a double one, complete, is £100. A semi-portable engine to work two of the machines is supplied by the General Fibre Company of London for £82-10. On comparatively small plantations, instead of the steam engine, bullock gear can be used which, for a single machine, is supplied at £30 by the Company.

2. We laid down the following programme for testing Programme for the tests. the above machines :—

15th October 1884.	Jute (<i>Corchorus olitorius</i>).
15th	Sunn (<i>Crotalaria juncea</i>).
16th	Potari (<i>Abutilon indicum</i>).
16th	Bhendi (<i>Hibiscus esculentus</i>).
16th	Joba (<i>Hibiscus rosa-sinensis</i>).
16th	Stolpodox (<i>Hibiscus mutabilis</i>).
17th	Plantain (<i>Musa paradisiaca</i>).
17th	Madar (<i>Calotropis gigantea</i>).
17th	Nona (<i>Anona reticulata</i>).
17th	Bon-dhenras (<i>Hibiscus ficulneus</i>).
18th	Agave (<i>Agave americana</i>).
18th	Dhoncha (<i>Sesbania aculeata</i>).
20th	Rhea (<i>Bœhmeria nivea</i>).
20th	Sansevieria (<i>Sansevieria Zeylanica</i>).
20th	Measha (<i>Hibiscus sabdariffa</i>).

Quantities of each of these fibrous plants were brought in on the respective days and were weighed and given for each of the machines to be tested. A note was kept of the quantity of stems or leaves given, of the time at which each machine began work, the time at which each finished work, and the weight of the dried fibre obtained, as also the number of hands working each machine.

3. The following table represents the results of the tests.

Results of the tests.

It will be seen that in the case of some

of the machines there has been no
result except that of failure:—

Fibre Machine Trials.

NAME OF FIBRE.	Quantity of green stems supplied.	Hour at which work began.	Time of expiry of work.	Weight of dry fibre extracted.	Percentage of dry fibre to weight of green stems.	REMARKS.	
						Sers.	Srs. Chs.
No. I.—BROTHER'S MACHINE, motive power, and 2 men.							
Jute	23	12.36 P. M.	1 P. M.	2	2
Sunn	10	3.28 ,,	3.36 ,,	0	10
Bhendi	20	.....	.....	.....	.....
Potari	6	.....	.....	.....	.....
Joba	4	.....	.....	.....	.....
Stopodo	8	.....	.....	.....	.....
Plantain	15	1.7 P. M.	1.12 P. M.	0	2½
Agave	20	12.20 ,,	12.36 ,,	0	6½
Dhoncha	10	12.38 ,,	.....	.....	.....
Rhea	20	4.6 ,,	.....	.....	.....
						1.04	Much waste ; not sufficiently cleaned. ditto.
						2.10	.....
						The fibres were torn away and destroyed.
						Failed. The stems glued on the rollers.

No. II.—Mr. BOOOAH'S
MACHINE, motive power, and 2 men.

Rhea	...	5	4.30 P. M.	4.55 P. M.	0	3	3.75
No. III.—Mr. BOOOAH'S HAND-MACHINE, 3 men.							
Madar	...	5	12.25 P. M.	1.21 P. M.	0	1 <i>1</i>	1.56
Rhea	...	1	3.50 "	4.10 "	0	0 <i>1</i>	3.12
No. IV.—POWNALL'S FLAX SCRAPER (1), motive power, and 2 men.							
Jute	...	15	1.5 P. M.	1.28 P. M.	2	0	13.33
Sunn	...	5	3.53 "	4	0	11	13.75
Bhendi	...	5	.....	.....	.....	.....	.....
Potari	...	5	•	.....	.....	.....	.....
Jobs	...	2	.....	.....	.....	.....	.....
Stolpodox	...	3	.....	.....	.....	.....	.....
Plantain	...	5	1.47 P. M.	1.51 P. M.	.....	.....	.....

This machine was entered to extract only Rhea. The fibre obtained is too much crushed and towey.

Fibre reduced to tow, with pieces of bark adhering. Clean, but too much crushed and towey.

Fibre full of bark and woody matter. Fibre dirty.
Ditto ditto.

Would not pass through the machine: the stems stuck to the rollers.

Fibres torn away. No results.

Tore away the fibres.

NAME OF FIBRE.	Quantity of green stems supplied.	Hour at which work began.	Time of ex- piry of work.	Weight of dry fibre extracted.	Srs. Chs.	Percentage of dry fibre to weight of green stems.	REMARKS.
Agave	...	10	12.45 P. M.	1 P. M.	0 24	1.40	Very insufficiently cleaned; dirty fibre. Better than preceding, but still dirty.
Dhoncha	...	2	1 "	1.12 "	0 2	6.25	Stems got clogged among the rollers : fibres torn away.
Rheea	...	5	3.52 "	.....	.....	.....
No. V.—POWNALL'S FLAX SCRAPER (2), hand power : 3 men in all.							
Jute	1.50 P. M.	2.15 P. M.	0 31	.....	Failed entirely to clean the fibre. Percentage not worked because of the quantity of wood in the fibre.
No. VI.—POWNALL'S FLAX SCRAPER (3), hand power : 3 men in all.							
Jute	2.42 P. M.	2.50 P. M.	1 2	.....	Ditto ditto.

No. VII.—POWNALL'S FLAX SCRAPER (4), hand power : 3 men in all.								
Jute	...	...	10	1-30 P.M.	1-48 P.M.	0	6½	..... Ditto ditto.
DRAHT AND ELLWOOD'S MACHINE, motive power, and 3 men.								
Rhea	...	...	40	3-17 P.M.	3-48 P.M.	{	15½*	2-42
						{	8½†	1-33
Sansevieria	...	...	20	4-8 ,,	4-33 ,,	{	4½	1-41
Agave	...	...	15	4-45 ,,	4-59 ,	{	4½*	1-98
						{	• 1 †	• 42.
Bon-bhennras (wild bhendi)	...	...	20	11-35 A.M.	11-51 A.M.	{	9 *	2-81
Plantain	...	...	.....	.....	.....	{	4½†	1-41
Pine-apple	...	...	.....	.....	.....	{	1	.....

Straight running fibre. † Waste fibre.

Results very satisfactory.
Even Bon-bhennras with its large amount of mucusilage was worked out with the greatest ease. Rhea was cleaned well: better than any produced in any trial hitherto held in India. The other plants also yielded fibres far superior to any samples to be had here.
Fibre harsh.

4. *Monsieur Berthet's machine* would probably have shown somewhat better results than it actually did, if a competent per-

son had been deputed to work it. Taking the results as produced, the machine has been found to be both destructive and defective—destructive in that it has caused an unnecessarily large amount of wastage of fibre, and defective in that it has failed to produce the fibre in a sufficiently clean state : woody parts, pulp, and pieces of the bark adhere to the fibres produced, and these extraneous matters, besides depreciating the intrinsic value of the fibres, add to the weight shown in the fifth and sixth columns of the statement.

The fibres obtained from *Mr. Borooah's machines* were sufficiently clean, but the repeated and excessive crushing to which they were subjected has caused a depreciation in their value, besides giving them a towey appearance. To these defects must be added the very slow rate of outturn which, in the case of steam power machine, was 3 chattachs of Rhea fibre in 25 minutes, and in the case of the hand-machine, half a chattack of Rhea in 20 minutes, and 1½ chattachs of madar in 56 minutes.

Of Pownall's four machines, not one produced any satisfactory results, notwithstanding the care and attention with which they were adjusted and worked by the agents under whose charge they were. The fibres obtained are conspicuous by their dirty condition, being full of bark and woody matters, and they become brown when drying.

Mr. Cantwell's process produced fibres which are certainly free from wood, bark, or pulp, but the retting has injured the fibres, in that it has rendered them brown. The improvement claimed by the patentee over the common native system is, that the natives by not crushing the stems have to allow them to steep for a period of 8 to 12 days, while he by crushing them in his sugarcane mill facilitates the action of the water while retting, and thus reduces the period of retting to

two or three days. Whatever advantage this may have, it does not, judging from the results, improve the quality of the fibre, or reduce the cost of extraction, while it adds to it the labour and expense of crushing.

Messrs. Death and Ellwood's machine did not work on the days specified above, as Mr. Death, who was coming out to work it himself, was unavoidably detained on the way by Quarantine regulations. As the dates specified were not a condition of the tests or of the award of prize, we arranged to have a test of this machine during the following week. The plants mentioned in the above table were supplied on the 28th October, and the fibres were worked out by this machine without a hitch of any kind. Indeed, the working parts are of so simple a character, of such sound material, and correct adjustment, that they leave nothing to be desired. The jet of water plays a most important part in the extraction of fibres; for the stems after having been bruised by the beaters against the edge of the feed-table, receive a very thorough treatment by the beaters on the broad jet of water, and, when pulled out, they are found to have been freed of all extraneous matters, leaving clean white fibre as the result. The machine is, moreover, as has been proved by the tests, capable of treating all fibre-bearing plants, whether exogenous or endogenous, with the same facility. A semi-portable engine of $2\frac{1}{2}$ nominal horse-power supplied the motion to the double machine used at the trials. At a rough estimate 1.75 indicated H. P. was expended in driving the double machine at 400 revolutions per minute while at work. As only one half of the machine was used for the purposes of the trials, the other half ran idle. The quantity of water required appears to be about 400 gallons per hour for one machine, but the water can be used twice or thrice over.

Taking the data obtained at the trials as a guide, the outturn of Rhea fibre from one (Death and Ellwood's) machine would be about 60 lbs. for a day of 10 hours. This assumes

a percentage of 3·75 of fibre from 1,600lbs. of green stalks. The operators were imported and to some extent trained hands, having worked similar machines in Madras, where they were accustomed to manipulate *Sansevieria Zeylanica*. Still they did not seem quite at home with the Rhea stalks, and some allowance might reasonably be made on this account. At the outside an increase of one-third would in our opinion represent an average day's work with dexterous and diligent workmen and stalks in good condition. It was noted that the stalks supplied to the machine were not uniform: they were of lengths varying from 2½ to 5 feet; and in withdrawing the fibre of the longer stalks from the machine more waste was beaten out of them than from the smaller stems ranging up to 4 feet. The reason is simple enough: the longer stems were rather too old for the yield of fibre, and had branched owing to the crop from which the stems were cut having been grown rather openly. The addition therefore of one-third would be equal to a work per diem of 2,200lbs. of green stalks per machine. This quantity might be expected to give at 3 per cent. an outturn of 66lbs. of good clean fibre. The value of this outturn, at £50 per ton, would be about 30 shillings.

It should be mentioned that owing to the late date of the trials with this machine, it was not found possible to procure suitable jute stems, as the local crops had already been cut. Some stems, however, which were over from the trials of the other machines, and had been lying for about ten days on the ground were tried. The machine cleaned them with ease; but as the stems had been lying exposed to the sun, the fibre obtained was somewhat stained. It is necessary, for the efficient treatment of exogenous plants especially, that the stems should be operated upon as soon as possible after they are cut. The cutting also should take place before the plant reaches full maturity, and the proprietors of Death and Ellwood's machine rightly claim that the juices which con-

tain the various gums and colouring matters in solution are then more readily removed by means of the water used. The trials certainly bear this out, for the wild bhindi, or bon-dhenras, which were fully matured and to some extent hardened plants, cut the day previous, gave the harshest fibre.

It remains to be settled whether the machine can be worked with profit. To solve this question completely and conclusively, detailed enquiries in various directions and much time would be needed, and we would have to wait for a valuation of the fibres by experts in Europe. It does not seem necessary to us to delay with this object either this report, or the recommendation we have to make, for the following reasons:—

- (1.) Although detailed statistical proofs are wanting, we have by rough calculation reason to believe that the machine can be worked with profit in this country, especially on Jute, Rhea, Bon-dhenras, or wild bhendi, Agave, Sansevieria, and Pine-apple.
- (2.) The machine is already at work in Mexico, in Jamaica, and several other countries including Southern India, and yields a profit.
- (3.) At gardens in factories where steam is already available, a few machines could be introduced at the minimum of outlay, as the cost of the machine alone would be incurred.
- (4.) Where water power is available, a turbine can be used, instead of the steam engine. When one machine is worked singly, the patent safety bullock gear supplied by the General Fibre Company can be used.
- (5.) When natives have gained experience in the feeding and working of the machine, they will probably be able to produce a larger quantity of fibre than at first.

The three last reasons form important considerations in reckoning the prospects which may be anticipated in this country. And as several firms in Calcutta have already made

enquiries with a view to making use of the machine, and they seem satisfied with what they have learnt, it does not seem necessary for us to delay our report. We are satisfied that as an extractor of fibres Messrs. Death and Ellwood's machine is a distinct advance in mechanism of this class, that it extracts fibres in their natural colour and in good merchantable condition, that it operates on all plants with the same facility, and that it is suited to the requirements of this country, and is likely to prove of great service to its fibre industry. On these grounds we recommend that the full amount available for the Government prize may be awarded to the General Fibre Company of London.

J. W. HANLON.

L. LIOTARD.

RESOLUTION.—By a Resolution dated the 5th September 1884, the Lieutenant-Governor was pleased to appoint Mr. J. W. Hanlon, Superintendent of Jail Manufactures, and Mr. Liotard, of the Revenue and Agricultural Department of the Government of India, to conduct such a competitive trial of machines and processes for the extraction of Indian fibres as might lead to the introduction into this country of a cheap, simple, and portable fibre-extracting machine. It was also stated in the Resolution, which was published in the *Calcutta Gazette*, that if the number of machines entered were sufficient to produce a satisfactory competition, the Government would be prepared to award a sum of Rs. 2,000 in prizes. The Report of the Committee, which has now been received, forms a valuable contribution to a subject of great commercial interest; and the thanks of the Government of Bengal are due to Messrs. Hanlon and Liotard for the care with which they have conducted the trials, and to the Agri-Horticultural Society of India for the assistance they have given by supplying the fibres used in the experiments. The Lieutenant-Governor accepts the finding of the Committee that the Universal Fibre-cleaning Machine invented by Mr. H. C. Smith, manu-

factured and improved by Messrs. Death and Ellwood of Leicester, and brought forward by the Genernl Fibre Company of London, is the best of the nine machines entered for competition. The mechanical working of this machine appears to have been rapid and effectual, and the further question whether it can be profitably introduced into Bengal may well be left to be decided by the commercial public, who have already shown considerable interest in the trials. The value of the fibres extracted, and the uses to which they can be put, are also matters to be dealt with by experts and commercial men in the course of their ordinary business, and no further action on the part of Government appears to be called for. Should it, however, be afterwards found that the facts ascertained in the recent trials are not complete enough to enable the mercantile public to form a fair judgment of the commercial prospects of the successful machine, further trials may be conducted under the superintendence of the Agricultural Department. In the meantime, in accordance with the recommendation of the Committee, the Lieutenant-Governor has much pleasure in awarding a prize of Rs. 2,000 to the General Fibre Company of London, for Messrs. Death and Ellwood's machine. This Resolution and the Report of the Committee will be published in the *Calcutta Gazette*.

By order of the Lieutenant-Governor of Bengal,

A. P. MACDONNELL,

Secretary to the Government of Bengal.

CALCUTTA ; }
30th December 1884. }

INDIAN WHEAT AND ITS IMPROVEMENT.*

IN the Proceedings of the Agri-Horticultural Society of India for July 1883, there appeared a very interesting minute

* Transferred from Proceedings for June 1884.

by Mr. W. H. Cogswell, President of the Society, on the subject of "Indian Wheat and what its future may become."

In this paper, Mr. Cogswell very justly and sagaciously observes "I know no valid reason why India should not, in time, supply the whole of what is called the foreign or imported wheat into England, which amounts to annually about 56 million cwts., worth thirty-one millions sterling. Of that quantity, about five million cwts., or nearly three millions sterling goes from India."

In reference to this very important subject, I would wish to point out that private enterprise will have to enter the field if India is to supply the United Kingdom, Europe and all Mediterranean Ports, with wheat of any desired quality, and as our present export wheat trade may very easily and speedily be raised to fifteen millions sterling per annum, with an export maize trade of considerable value in addition, I am induced to hope that the publication of this paper will tend to secure the support of all members of the Society resident in localities possessing suitable soil and climate for the production of superior wheats and maize from imported seed.

It has, I believe, been established, that in Bengal Proper all varieties of American maize answer perfectly, if sown as soon as the rains are over, whilst from Meerut northwards to Rawul Pindee, all imported varieties succeed if sown as soon as the rains commence. From Allahabad to Boolundshuhur, all **EARLY VARIETIES** of American maize should succeed if sown on lands under canal irrigation, as a safeguard against drought and late rainfall.

The Agricultural population from Allahabad to Rawul Pindee cultivate "*Jowar*" (*Holcus Sorghum Vulgare*) extensively, and subsist on the bread made from its flour. When in season, they roast and eat unripe country maize, and the mature seed when ground into meal is also made into bread. Thus it is quite in the power of the cultivators to supply themselves with food from these two crops, and when removed

to grow wheat for export, after retaining sufficient for all wants.

Before proceeding further, I would wish to observe, that as soon as the Ryots and Zemindars learn that there is a considerable demand for superior maize for export, they will readily give up the cultivation of "Bajra" (Spike millet,) "Murwa," (*Eleusine coracana*), "Kungnee," &c., &c., and in their stead grow maize crops suited to the locality.

The movement depends on the introduction and acclimatization of imported maize seed, and to effect this, European Landholders, Planters, and I hope Members of Society, will come forward, and cultivate imported maize, and distribute the seed to the Zemindars in the neighbourhood. In Bengal much may be done during this year. But for Upper India the season is too far advanced for seed if now ordered to reach in time. At the same time arrangements might be entered into to secure an ample supply of seed maize of this year's crop for sowing during 1885.

I may now pass on to the wheat question, and the introduction of superior varieties in demand in the London market.

Of our Indian wheats, the variety of soft white wheat called "Daood Khani," i. e., (King David's Family or household wheat) is the one most appreciated in the London market, and every endeavour should be made to obtain genuine seed-wheat of this variety for cultivation in the Northern Dooab and Punjab.

The so-called Russian (*Saxonska*) wheat, which in the London market has realized the highest price, or 52 shillings per quarter of 496 pounds weight, should also be introduced into India.

I consider both these wheats have at some remote period of antiquity passed the former from Palestine to India, and the latter from Palestine to Russia.

Superior as these wheats are found to be, they are 'nowhere' in comparison with the "Mammoth Golden grain wheat of

Palestine," 100 seeds of which, taken as they came to hand weighed exactly eighty-six grains, whilst 100 seeds of the best Indian soft white wheat reported on by the London Experts, weighed 55·44 grains, and was valued at 49 shillings per 496 lbs. The difference between 86 grains and 55·44 grains is 30·56, and indicates a superiority, which may be approached, but can neither be equalled or surpassed by any other variety of wheat.

A hundred grains of the Russian (*Saxonska*) wheat weighed 37·3 grains, or 48·7 grains less than the Mammoth wheat of Palestine.

The Russian wheat on the average contained 22·65 per cent. of Gluten, the Indian soft white wheat only 6·4 per cent. thereof, and this accounts for the difference in price, although the Indian wheat gave 77·46 per cent. of flour to the Russian 72·2 per cent.

It is therefore evident that the Indian wheat must be so manured as to have its percentage of Gluten increased, which can be very effectually done by the proper use of saltpetre as a mineral manure.

The seed of this wheat received by me from the Society, was sown by me in Dehra Doon in November 1882, it germinated freely, the plants grew vigorously, and came into ear. But as ill-health from the sudden heat compelled me to leave almost at a moment's warning for Mussoorie, on the 1st of May 1883, the crop was lost. Had the seed been sown early in October, the grain would have been ripe by the end of April.

The experiment shows that the Mammoth wheat of Palestine will perfectly suit the soil and climate of the Northern Upper Provinces, and as the Punjab has a sharper and longer winter, and a cool spring which gradually passes into dry warm weather, the precursor of the true hot season, the wheat in question should grow to as great perfection in the Punjab as it does in Palestine. In America it has produced

sixty-four bushels (or over $46\frac{1}{4}$ maunds) of grain to the acre, and should do the same in the Punjab and elsewhere. *

When it is borne in mind that fifteen maunds of wheat to the acre is considered a good crop, some idea of the money value of a wheat which yields, over three times that quantity, may be formed. To put the question in a still more practical form. The Zemindar who has an acre of land under this wheat obtains in one year the harvest of three years, and has one and three quarter maunds of seed wheat to spare for the next season's sowing. *

In 1882, the seedsman's price in America, for a package of this wheat, containing about 500 grains was 25 cents. plus cost of carriage. But as the cultivation has extended since then in the West and Southern States of America has also in Pennsylvania, the present cost should be very much less, and the seed may now be procurable by the bushel.

The white Russian spring wheat which is said to yield from 40 to 50 bushels (maunds $29\frac{1}{4}$ to $36\frac{1}{2}$) per acre, would be a valuable introduction. Its price per bushel including bag is $2\frac{1}{2}$ Dollars, plus freight, *via* London to India. *

Mr. James Gregory, Marblehead, Massachusetts, U. S. America, can supply the Palestine and white Russian wheat. The Russian (Saxouska) wheat is on sale in large quantity in the London corn market, and local arrangements would secure the "*Daood khani*," soft white wheat.

To carry out the project, subscriptions might be invited from the various Firms in Calcutta, Bombay, Agra, Cawnpore, Lahore, &c., who are interested in the Export wheat trade. The subscription list to be open to the general public, as well as the members of the Society. Rs. 5 to be the minimum subscription. All remittances to be sent to the Secretary, Agri-Horticultural Society, Calcutta, and a paper or memorandum to accompany to show, whether the subscriber wishes the money to be invested in the purchase of maize or wheats, or both, which would be supplied accordingly.

The mercantile Firms and their Agents in the North-Western Provinces, Oudh, and the Punjab, would have no difficulty in getting the Zemindars to sow, grow, and harvest the new wheats. The growers engaging to reserve sufficient seed wheat for future sowing, and the Firms purchasing all the wheat being the produce of the imported seed given. To guard against failure due to a short winter, the cultivation should in Oudh be restricted to Goruckpore and suitable places to its north. In the N.-W. Provinces to Meerut, and all districts to its north, in the Punjab to Jullunder, and following the line of Railway to Rawul Pindie.

I venture to submit that if the suggested plan of operations be carried out, money and seed would be forthcoming.

The Missionaries in the Punjab who are widely known and respected, as also the ladies of the Zenana Missions, if supplied with seed wheat, would have no difficulty in causing the same to be cultivated, and in this way wheats, the very existence of which are at present unknown, would come into the possession of selected Agriculturists, and the seed be carefully preserved for future sowing.

J. FRED. POGSON.

SIR LAWRENCE PEEL.*

THE President announced the death of a very valued Honorary Member of this Society, The Right Hon'ble Sir Lawrence Peel, who died at his residence, Garden Reach, Ventnor, Isle of Wight, on the 22nd of July last. There are now but few Members left in India who can personally remember Sir Lawrence Peel's connection with this Society; he was elected an Ordinary Member in 1842, when Mr. Lawrence Peel, Advocate-General of Calcutta, and later Chief Justice of the Supreme Court, he was soon after elected Vice-President, and on the retirement of Sir J. P. Grant in 1848,

* Transferred from Proceedings of August 1844.

was elected to the office of President "with acclamation," which office he continued to fill till 1854. On his retirement a Committee of the Council was appointed to wait upon Sir Lawrence Peel, with a request that he should sit for his portrait, the following letter was addressed by him to the Acting Secretary on the subject, dated 18th July 1854 :—

"I have the honor to acknowledge the receipt of your obliging letter. The kind feeling evinced towards me by the Members of the Council, and of the General Meeting who joined in the request to me which your letter conveys, is reward enough for any services which I may have rendered to the Agricultural and Horticultural Society of India. To have been honoured by the appointment which I held in the Society, and to have received so kind an expression of regret at the loss of my services which will shortly ensue, is really more than my services have merited and so great an honor as having my portrait placed in its Hall, is one of which I cannot accept. I am averse to receiving any public honors which should in my opinion be rarely bestowed, and then only on men of an order of merit far surpassing mine. I am conscious that I have done little for the advancement of the most important interest of our Society, the promotion of Agriculture, and the stimulus which I may have given to Horticulture by following a very favorite pursuit is not a merit of mine, though I may have been indirectly instrumental in promoting the Horticulture of India. Looking at the names which our Society has possessed and still possesses, I cannot place myself at all on a par with them ; and as to the services of President merely, the appointment rewards me in the distinction and honor which it confers."

The following farewell address was presented to Sir Lawrence Peel in September 1855 :—

SIR,—When your letter, resigning the Office of President of the Agricultural and Horticultural Society of India, was submitted at the General Meeting in July 1854, the Council

expressed their great regret at the loss which the Society thereby sustained, and recommended that a suitable address should be presented to you at the proper time ; and that, in the meanwhile, you should be requested to sit for a full length portrait, to be placed in the Society's Hall, as a memorial of the services rendered by you to this Institution. The Meeting fully entering into the sentiments of the Council, resolved that the above recommendations be adopted and carried out.

At the General Meeting held in the following October, we learnt with regret, that you had declined the proposal of a portrait for the reasons detailed in your letter then submitted. Such being the case, it only remains for us to reiterate the expression of the loss the Society has sustained by your resignation of the Office of President, which you have held for upwards of six years.

While during your residence in this country you have done much to promote, in various ways, the cause of Horticulture, more especially by the constant importation of new and valuable plants, which have been propagated and freely distributed, and which demand our best acknowledgments, we feel that they are no less due for your liberal assistance to the Society at various periods, more especially towards the establishment of Floricultural Exhibitions, which have been regularly held during the past ten years, in frequent contributions to our garden and library, and for timely aid rendered enabling the Society to arrange satisfactorily for obtaining possession of their present handsome apartments in the Metcalfe Hall.

Though general allusions may seem irrelevant in an address of this character, we cannot, Sir, overlook the fact, that the Society has been fortunate in having possessed for several years, the services of a President whose distinguished philanthropy will long preserve his name and character, not only among the Members of this Institution, but in the grateful recollection of the inhabitants of Calcutta.

With best wishes for your restoration to health, and many years of happiness in your native land, we beg, on behalf of the Society, to tender you a hearty and sincere farewell.

The following was Sir Lawrence Peel's reply to the above address :—

" GENTLEMEN,—I thank you heartily for the address which you have done me the honor of presenting to me. I should not merit your good opinion, if I could receive this expression of it with indifference. If, as I think, you have overrated the value of my services to the Agricultural and Horticultural Society of India, it is your kindness which has warped your judgment, a kindness that never failed me during the whole period of my service as an officer of the Society, which I served first as Vice-President, and afterwards as President for nearly thirteen years. A taste for Horticulture, one of the objects which this Society was formed to promote, a skill in laying out grounds which I know not how I acquired, a wish to promote in others innocent tastes which I have found so productive of enjoyment to myself, a deep sense of the usefulness of the Institution, and zeal to promote its interests, beyond these I am not aware that I possessed any qualifications for the office of President of our Society. A Society which possesses not a few members who unite to the above qualifications those of a higher nature, some rich in science, in which I am poor indeed, and others better acquainted than I am with the natural riches of this teeming land, and better able than I am to instruct others as to the place of growth, and mode of cultivation and preparation, of many of its important and as yet undeveloped productions.

I thank you, Gentlemen, for the wishes for my health and happiness in another land which you have kindly expressed.

You have alluded in terms of praise to my gifts of money. It is true that I have given away much money, but I take therefore little credit to myself. I gave out of my abundance

but there are many amongst us who poor themselves, give away that which they can scarcely do without, and suffer privations because of their gifts. I never had the wish to lay up riches, and in forbearing from accumulation I have practised no self-denial and therefore merit not praise. It is rather a happiness than a merit to possess a heart that warms towards one's fellow-creatures, and I thank God that he has never suffered me to think myself better than, or apart from, other men, and that he has given me the wish to share with them that which has been given in abundance to one that deserved it little. I hope that I may by His mercy be permitted, though possessing less abundant means, to contribute still in the same proportion to my means, to the wants of others, and as I shall continue to draw the larger part of my income from this country, its poor will still have the first claim upon me.

It was a vain and foolish, if not an ungrateful thought that which I once entertained, that the day of my departure from this country would be one of pure joy. I feel now that in parting from many friends whom I love and respect, from some in humbler stations who have been attached to me by the ties of service, from those who have tended me in the time of sickness and trouble, notwithstanding I shall set out to join those from whom I have been long separated and whom I dearly love, sorrow will at that day mingle largely with my joy. Gentlemen, I bid you farewell in the hope, that when I am no more, I may be remembered, though for a little time, as one who loved the land of his temporary adoption with a love inferior to that only which he bore to the land of his birth."

It was Resolved "That the foregoing extracts from the records of the Society, be embodied and published in this day's Proceedings, as a tribute of respect to the Memory of the deceased Honorary Member and Most Excellent President."

Although the above was Sir Lawrence Peel's decision, the Society was some time afterwards fortunate in becoming the possessor of a portrait of him, which they purchased, and it hangs in the Hall over the bust of the founder Dr. Carey.

ANCIENT INDIA, AND ITS CATTLE SALT.

ON referring to the Bengal Directory for 1824, I find that, Mr. Senior Merchant John Fendall, who entered the Civil Service in 1779, was appointed a Member of Council on 20th May 1820, and then held the appointment of President of the Board of Customs, Salt, and Opium. It is therefore reasonable for me to assume that the Board in question existed, if not so far back as 1779, certainly in the year 1800, which gives it an antiquity of 84 years, in place of over one hundred.

The Bengal Civilians of the period being looked up to by all Hindoos and Mahomedans with fear and trembling, to have uttered any word in their presence having a meaning not fitted for ear's polite, was quite out of the question and explains why the President and Members of the Board in question, never heard the two Sanscrit words by which Cattle Salt was known by the vast population of Hindooostan.

To prove what may be considered an assumption, I give beneath from Regulation XVII of 1810, a list of the different kinds of Salt which paid Duty, namely :—

- | | | |
|----|---------------|--------------------|
| 1. | Lahoree Salt, | 1 rupee per maund. |
| 2. | Sambhur ,,, | 12 annas ,,, |
| 3. | Doodwanee ,,, | 12 ,,, ,,, |
| 4. | Balumba ,,, | 8 ,,, ,,, |
| 5. | Salumba | |
| 6. | Furra | |
| 7. | Boraree Salt | |
- }

Hence it is clear that had the existence of *Cattle Salt* been known, it would not have escaped taxation or Excise Duty, which in those days was levied even on the dried leaves of the *Cinamomum Tamala* sold in the Bazars, under the Hindee name of "*Tej-putta*."

The *Bengal Dispensatory*, edited by Professor W. B. O'Shaughnessy, and published in 1841 by order of the Government of India, contains not even an allusion to the well known

Cattle Salt of India, which was made in Hindoostan when Sanscrit was spoken, and was in use when the Mahomedan conquest of India took place, and has been made and is in use to this day, without the Salt Department of 1884, being any better informed on the subject of its preparation from Culinary Salt than was the Salt Department of 1784, or in the days of John Fendall, the future President of the Salt Department.

On referring to the ninth edition of Professor Samuel Parke's work on Chemistry, published in London in 1819, I have found a short note, in which the ancient Cattle Salt of India is spoken of as the "*Salt of Bitumen* of the Hindoos, which is almost the only article of Hindoo physic, and is sold in every village, is chiefly composed of Muriate of Soda, and sulphurated hydrogen. It is taken by these people for every complaint." "The farriers give it to the horses, and seem to understand the principles on which it acts; for when they have given a dose to the animal, they always give him water to extricate the gas." Professor Parkes makes this quotation from '*Henderson on Hindoo Physic.*'

If Henderson advanced the opinion, that the *Cattle Salt* under notice was a *Bitumenized* product, he not only erred himself, but caused the London Professor to do the same, and for this reason, that the Salt in question has nothing whatever to do with Bitumen, and I very much doubt, if it could be produced by the use of Bitumen.

The oldest, if not the first allusion to this ancient Cattle Salt, dates from 1808, when Captain Joseph Taylor's Hindoo-stanee and English Dictionary was published in Calcutta, and allowing the Manuscript to have been four years old when published, I arrive at the conclusion that 80 years have passed since the Sanscrit words for this Salt first appeared in print.

My object in tracing back the past 80 years of history of this Salt, is to establish the important fact that no Excise Duty was levied on it, and it follows that if the Salt Manufacturers of Great Britain prepare a similar Cattle Salt, and

export it to India for sale, no Excise or Salt Duty can be levied upon it.

The price of British Salt per ton is fifteen shillings, and as Cattle Salt similar to that which has been in use for over two thousand years in Hindoostan, could be made and sold at twenty shillings per ton of 27 maunds, the further development of the Salt Trade of England, and the urgent wants of the Cattle of India alike demand the manufacture and supply of the therapeutic condiment needed.

It is now generally and officially admitted that the fatal forms of cattle disease so prevalent in India, are almost entirely due to the want of Salt, which is a natural constituent of the blood of man and beast, and fatal disease follows when the normal quantity present in the circulation is detrimentally reduced, which is invariably the case when Salt is not added to the food of man, and the fodder of Cattle.

The indigenous Cattle Salt costs four annas per seer in the plains (Dehra Doon), and five at Mussoorie, whilst the Punjab Rock Salt is sold at half the price. The dread of the Salt Department is, that if cheap Cattle Salt be placed in the market, the purchasers would operate upon it, purify the Salt, and by its use injure the State Revenue derived from Salt. The experience of the past 80 years shows that this has as yet not been done, and I submit never will be done, even if the Cattle Salt be sold at 32 seers per rupee.

The want of cheap fuel will prevent the manufacture of Cattle Salt at the Punjab Salt Mines. But should good coal be found (which is by no means improbable,) there is nothing to prevent the waste unsaleable Salt of the Mines, being converted into Cattle Salt.

I must now go back to Taylor's Dictionary which in a few years got out of print, and a copy which passed into Mr. John Shakespeare's possession, was used by him, as the basis of his own Hindooostanee, Persian, Arabic, and English Dictionary, the first edition of which was published in London in

1817, and the third, from which I quote, in 1834. In it at page 359 appears the words *Padanon*, meaning given—“Black Salt, prepared by melting common Salt, with a small proportion of myrobalans. It contains sulphur.” The literal meaning may not be translated. At page 342 is the Sanscrit word *Beet*, meaning the dung of any animal, and is the same as “*Beet-lon*,” meaning a factitious Salt containing sulphur.

I caused some of this foul smelling and nauseous Salt to be analysed by a professional Chemist in Government employ, and it was ascertained that the Salt had been obtained by fusion, contained sodium sulphide, was strongly impregnated with Sulphuretted Hydrogen Gas, and its colour was due to some vegetable matter, not known.*

Some pounds of a similar Cattle Salt were then made, and a small quantity of charcoal was used which gave it a black colour, whilst the Salt purchased in the Bazar had a brown red colour, or a dull garnet red colour, with this exception there was no other difference between them.

I have sent one pound of the Bazar Salt, for comparison with the same description of Salt sold in the Calcutta Bazaars, and if the mode of manufacturing this Cattle Salt in Bengal can be ascertained, the publication of the Formula will enable the English Salt Manufacturers to produce a similar therapeutic Salt at the cheap rate mentioned, in place of Rs. 10 per maund or Rs. 270 per ton.

* [Note by Editor.]—In Mr. Baden H. Powell's Hand-book on the Economic Products of the Punjab, (Roorkee 1868.) The following note on Black Salt is given, “The Black Salt is made as follows:—Ingredients, one maund of Sambhur, or Dindwa Salt; quarter of a seer fruit of Terminalia Belerica (“*bakerah*”), quarter of a seer of the fruit of the Terminalia Chebula (“*har*”), quarter of a seer of Emblica Officinalis (“*Aonta*”), quarter of a seer of black sajji (impure carbonate of soda): all these are put into an earthen pot over a fire and kept there till scorched: when about 35 out of 41 seers remain, the pot is taken off and the Black Salt is made. About two maunds of wood are used. The price is now in Bhawani about Rs. 8 per maund. It is used only as a medicine, and is exported to the N.-W. Provinces and to the Punjab. No tax is levied at Bhawani, but it pays duty as salt when taken across the Custom's line.”

I may now mention that acting under orders, I sent Mr. Carey, the Salt Commissioner, Salt Revenues of Northern India, two pounds of this Salt, and have heard nothing further on the subject.

In conclusion, I have to beg the favour of your laying this minute of the Cattle Salt question before the President and Council of the Agricultural and Horticultural Society of India, who, I venture to hope, will sanction its being published in the next Proceedings of the Society, so that the subject may become known to Indian Manufacturing Chemists, and also to the Proprietors of the Brine Springs and Salt Mines of England, whose practical Chemical knowledge and ample working plant and capital will, within the next six months, enable them to supply all India with that great desideratum, cheap Cattle Salt containing all the constituents of *Culinary Salt*, plus Sulphur and the foetid Sulphuretted Hydrogen Gas.

J. FRED. POGSON.

Baboo Protapa Chundra Ghosa, Vice-President, makes the following remarks on Captain Pogson's paper :—

Mr. Pogson's letters are herewith returned with thanks. The Sanscrit names of the Black Salt, the "Bitlun" of the Bazar are—

- 1st.—*Bida*. Which also means poison.
- 2nd.—*Bida-Gandha*. The poison smelling.
- 3rd.—*Kila-lavana*. The Black Salt.
- 4th.—*Dravidaka*. Is it because it was originally brought from the Dravida (Deccan) country ?
- 5th.—*Khanda* and *Khanda-lavana*. The prepared, or compound Salt.
- 6th.—*Kritaka*. The manufactured as distinguished from Rock Salt.
- 7th.—*Khara*. The alkali.
- 8th.—*Asura*. The Salt of the demons.

9th.—Supakya. The digestive.

10th.—Dhurta. The bitter.

11th.—Kritimaka. The artificial.

This Salt is exempted from Salt Excise Duty, as it is not an article of domestic consumption, its foetid smell preventing it from being used as Culinary Salt. It is a medicine with the Kávirájas who not only administer it by itself, but also mixed up with other ingredients, as a carminative and digestive. It is prepared by fusing *Fossil Salt* with small proportion of Emblica Myrabolans, and the result is a compound of muriate of soda, with traces of muriate of lime, sulphur and oxide of iron. These last give it the well known smell. It is largely used by the country Veterinary Surgeons in treating diseases of horses and cattle, affecting their digestive functions. It enters in the preparation of the well known Hajami-goli, the common digestive pills of the *Chutni-wala*. It is an unfounded apprehension to fancy that the Excise Officers will impose a Duty on it if it were prepared in large quantities. I am informed that in 1873 the Police of Howrah sent up to the Calcutta Magistrate, certain persons who were charged with manufacturing this Black Salt and smuggling the same. The Presiding Magistrate, I am told, acquitted the accused on the ground that Black Salt does not come under the category of Salts mentioned in the Regulations and Acts for imposing Duty on Salt. If the Salt Department were so forgetful as to impose a Duty on this production they might impose a similar Duty on several other Chemical and Medical Salts. I have not seen Mr. Pogson's new production, but if it is as foetid as the ordinary Black Salt, he need not be anxious about it. It is a great mistake to fancy that the Revenue Officers of the 18th century were not aware of the existence of this Salt. They know it and must have intentionally excluded it from Excisable Salt.

The following editorial note was published in the *Indian Agriculturist* of 21st June last :—

"The problem of so denaturalizing Salt as to make it palatable and wholesome for the use of Cattle, and available likewise as manure, whilst at the same time rendering it unfit for human consumption, and so open to issue Duty free to Agriculturists and owners of stock, without risk to the revenue, has proved to be one very difficult of solution. In compliance with the orders of the Government of India that experiments be made in the matter, a conference was held composed of the Chemical Examiner, the Director of Agriculture, and the Inspector of Cattle Diseases, who however, arrived at the conclusion that the problem was one incapable of solution. Since then, the Inspector of Cattle Diseases has been himself trying a series of experiments, but with no better success, the difficulty consisting in discovering a substance low enough in price which, whilst chemically combining with Salt in a manner so as to defy extraction by any Chemical process, would at the same time render the Salt so treated available for the purposes above stated. Government have consequently been forced to admit that no practical result is likely to be attained under present circumstances in this Presidency from further experiments, but as the measure is one of such obvious importance to agriculturists and stock-owners, they have recommended to the Government of India, as the only likely method of solving the problem, that the reward be offered, say of £200, to any one who may discover a Chemical process which will effectually satisfy the required conditions."

Captain Pogson writes in continuation of his notes on this subject :—

Will you be so good as to mention on my behalf that whatever may have been done in former times, the Black Salt of our day is made from Salt, which has paid Duty. Hence the manufactured article 'Black Salt,' cannot be made to pay a

Duty second time. I was under the impression that this Black Salt was made from Salt *exempted* from Excise Duty, and from Illicit Salt. But this is not the case, and any person may make Black Salt, from *duty paid* Culinary Salt.

The Punjab Salt pays a Duty of Rs. 2 per maund, and is retailed at Rs. 5 per maund. Whilst the Cattle Salt, or Black Salt made in parts of the Punjab is retailed at Rs. 12-8 per maund. This seems a very high price for Culinary Salt impregnated with Sulphuretted Hydrogen Gas. The question is how is this impregnation accomplished.

The formula given does not produce the desired result, and I much doubt if the *true formula* has been communicated to the Salt Department, as stated by Mr. Carey in his letter to Government. For if so, what could be easier than for the Salt Department to convert the very large quantity of waste unsaleable Salt, its dust, and grit into Black Salt, for sale at a moderate price in P^t of Rs. 12-8 per maund.

My views are that the price of Cattle Salt should pay a reduced Duty, and so become cheaply available.

The Salt Department apparently think that if Cattle Salt be made cheap, all classes will purchase and purify it for Culinary purposes, and so defraud the Department. If the matter of manufacture was taken up, I could suggest a remedy for the evil predicted. The substance added in course of manufacture could not subsequently be removed, and whilst it would prevent the Salt being used by man, it would, in no way, be injurious to cattle.

The following is the method of rendering Culinary Salt unfit for human consumption, and yet suitable for use as a Cattle Salt:—To every pound of Culinary Salt I would add 35 grains of Tartar Emetic in aqueous solution. This, in England, could be done in the process of Salt Manufacture. This quantity would suffice to nauseate any human being who tampered with such Cattle Salt; but it would, in no way, injure cattle. In fact it (Tartar Emetic) is beneficial to them, horses included.

As a Dye, Turmeric solution might be used, and would be cheap and effectual.

I only hope the English Salt Manufacturer may see the Proceedings of the Society, and so be induced to take up the manufacture. By this plan the yellow nauseating Cattle Salt would soon be known all over India. The ordinary Black Salt of the country would remain for use, by man, as heretofore, and the Salt Department might make it up for sale at a cheap rate in the Punjab, Upper Scind, and export to Afghanistan.

J. FRED. POGSON.

WHEAT AND JUTE FIBRE PREPARING MACHINES.

THE following report was prepared by Mr. W. H. Cogswell, President of the Society, on a Garwood's Machine tried by him :—

A few years ago, I was called upon to report on the quality of some Jute grown at Elouhra near Cairo, which prior to its being subjected to the usual retting process, was passed through a machine called Garwood's Patent, which may be briefly described as follows, *viz* :—A fluted roller about 20 inches long and 6 inches in diameter, over which six half-inch rollers are fitted in curved brackets so that they cover about half its circumference. The whole is mounted on a light frame about 4' x 1'9" x 2'9" high. The roller is made to revolve either by hand or other power and the stalks fed by hand, they are drawn in and crushed against the series of rollers, which have a certain amount of play; as they are made to revolve there is no drag on the fibre and the friction is not great.

When I made the report above alluded to I had not seen this machine, and it was only in October last that I had the opportunity of examining and testing its capabilities.

Unfortunately the Jute season was so very far advanced

that really desirable stems of the plant could not be procured, all being more or less overgrown.

I saw sufficient, however, to satisfy me as to the qualifications of the machine.

I had put through its rollers a given weight of green stalk ; the time occupied in doing so being twenty minutes.

The quantity of clean fibre obtained from the after-manipulation may be taken at about the same percentage as that given in Mr. Garwood's memorandum of a trial made in Egypt in November 1881, and on which said samples I had the honour of reporting in that year, see *Journal, page 250, Vol. VI, Part IV.* The following are his figures :—

"Labour employed in the operation as follows :—

2 Men to reap the Jute.
2 „ „ turn the machine.
1 Man „ feed.
1 „ „ receive.
2 Men „ stack.

—
Total ... 8 Men.
—

The machine produced the following quantity of fibre (green) :—

1st hour	... 22 Okes or 66 lbs. avoirdupois.
2nd „	... 25 „ „ 75 „ „
3rd „	... 26 „ „ 78 „ „
4th „	... 31 „ „ 93 „ „

NOTE.—It will be seen that as the men became more accustomed to the work the output increased.

The total quantity of green fibre produced in the four hours will thus be 812 lbs. or equal to 200 square yards area of Jute field. Some of the stalks were unusually large being at the butt-end one-half inches diameter."

I had the macerated Jute, with its crushed stems submerged in water. Along with it I placed exactly the same quantity

in weight of Jute plant treated in the usual native method.

Both bundles remained immersed for fourteen days. The machine-prepared sample took as long a time in the retting process as did the sample treated in the usual native way of steeping only.

Mr. Garwood claims for his machine simplicity and cheapness, the cost being £15 F. O. B. in Liverpool.

It scarcely lies within my province to criticise the machine, but without risk of giving offence, I am of opinion that much greater strength throughout would be necessary, if the machine ever came into use.

Mr. Garwood appears to me to place too much value on the results to be achieved by the use of this machine as to the saving of time in the operation, for from erroneous data furnished to him, he has been led to understand, and most incorrectly so too, that the retting process occupied the natives of this country two to three months, whilst in his trials in Egypt, of Jute passed through his machine, afterwards in the mace- rated state, soaked, stripped and cleaned, and the fibre finished and ready for market, only a month elapsed.

The fact being in this country that the retting process is completed in seven to ten days, according to the temperature of the water, the hotter the weather the quicker the process, as fermentation sets in more rapidly and the fibre is ready for market within a fortnight of the plant being cut.

I have more than once pointed out when writing on this subject that time is not an element of cost to the producer in this country, and that being the case, this machine does not recommend itself to the native cultivator of Jute; again any machine which performs an intermediate process only, as this one does, and does not deal with and complete the extraction of the fibre in one operation, is not likely to be sought after, or recommend itself to the consideration of the cultivator.

The only machine, to my knowledge, which has yet approached to what is desirable, nay, absolutely needful, is that

known as Death and Ellwood's, Smith's Patent, Fibre Extracting Machine, which I have had the privilege of seeing in work recently. It is called the Universal Fibre Cleaning Machine, and is simple and strong in all its parts. Like some other machines for the same purpose it consist of a drum on which metal beaters are bolted, the drum revolves at a great speed in front of an adjustable plate fixed below its centre, so as to give a scraping action to the fibre which is fed in by hand over the plate. Immediately below the plate a jet of water is forced which, while washing the gum and mucilaginous matter from the fibre and ridding it of particles of stalk and other foreign matter, forces it up against the drum and thus keeps it subjected to the action of the scrapers, and it is in this the success of the machine lies; unlike others it has an *elastic* bed of water, instead of a rigid one of wood, to support the fibre while under treatment from the scrapers. The price of a single machine without engine is £55.

The original outlay, the cost of working and maintaining it would, however, be prohibitory to a ryot, but a Company might be formed to establish its use in the Jute growing districts, to purchase the plant when it was ready to cut in the season, from the cultivator, and such a Company could prepare and completely make ready the fibre for sale in the open market. The native cultivators have not the money to spend in purchasing, or maintaining in efficient working order any machine, no matter how desirable and thoroughly good that may be, and I am of opinion that such must be first introduced to the growers in the way which I have suggested, if success is to attend their working.

W. H. COGSWELL.

CALCUTTA, 30th December 1884.

CHRYSANTHEMUM CULTURE.

*Note by Mr. C. Maries, Superintendent of the Durbhanga
Raj Gardens.*

CHRYSANTHEMUMS are amongst flowers, some of the most ornamental, and varied, besides being one of the easiest plants to grow. In this part of India they require little or no care, but in Calcutta a little special ground must be prepared. I advise planting out in an exposed situation, in beds raised about two feet above the surface level, well drained and a good mixture of tank soil, and old cowdung. If grown in pots, the same soil will do, with thorough drainage and the pots raised on bricks during the rains.

Cuttings from suckers, should be put down in shade in November and December, and when well rooted, can be planted out into their permanent place in the border, or put into pots. When about six inch high pinch off the top and continue this 'pinching' or 'stopping' till August, to make fine bushes. When the flowers are just beginning to break and show color, give frequent watering of cowdung and water, a handful of new dung to a four-gallon water pot, three times a week, the soil should never be allowed to get dry, as nothing is so injurious. A good plan is just after the rains to top dress the pots with very rich soil, half old cowdung and soil.

Pests:—*green fly*, syringe with soap suds, or dust with tobacco powder.

'*Grubs*.'—The larvæ of a night moth, the only remedy is hand picking as soon as the leaves are noticed eaten, and they are thus easily got rid of.

The Chrysanthemum is the national flower of Japan, and is the Crest of the Emperor. The finest varieties have come from that country, where I once saw a flower 14 inch across, like an enormous sunflower. The best collections are to be seen in the city of Yedo or Tokeo in Japan, and at a nursery called Asara, near the Asara Temple, or in Yokohama, at Kosoburio's nursery.

Some of the best sorts are—

- | | |
|----------------------------|--|
| 1. Model of Perfection, | 17. Mons. Lariss, |
| 2. James Salter, | 18. Parasol, |
| 3. George Salter, | 19. Baron de Prailly, |
| 4. Nagasaki Violet, | 20. Tourville, |
| 5. La Nymphé, | 21. White Empress of India } both very |
| 6. Beauty, | 22. Golden " " " } fine. |
| 7. Chinaman, | 23. Marguerite, |
| 8. Elaine, | 24. Fulgorc, |
| 9. Lord Derby, | 25. Madame Montelles, |
| 10. Lord Beaconsfield, | 26. Mr. Gladstone, |
| 11. Delicata, | 27. Venus, |
| 12. Pere Duclerc, | 28. Jardin des plantes, |
| 13. Mrs. Holford, | 29. Gluck, |
| 14. Bob, | 30. Sarnia, |
| 15. Duchess of Gerolstein, | 31. Mrs. Parnell, |
| 16. Rex Rubrorum, | |

And many others. The above have been grown here, and are now coming into full bloom. I think there is no flower more valuable in this country, coming as it does between the summer flowering plants, and the winter annuals and roses. They are invaluable for cut flowers, lasting a long time in water.

WITHER BLIGHT.

THE following communications on this subject from Messrs. Bird & Co., are of interest to the many Members of the Society connected with the Tea industry, by giving them a prominent place in their Proceedings and in the Journal, the Council hope to draw the attention of those interested to the subject, and will be glad to receive their views as to cause, soil on which the blight makes its greatest ravages, time of the year in which it appears, surroundings of affected localities, and such other information as may be useful, and may lead towards a remedy being suggested when the different facts and opinions are focussed and submitted to competent persons.

From Messrs. Bird & Co. :—

Referring to our conversation with you to-day *re* "Wither Blight."

We annex copy of our Manager's remarks on the subject, and shall be much obliged if you will give us information bearing on this important point, its cause and remedy, &c.

EXTRACT.—A good deal of "Wither Blight" is on the Assam portion and indeed it is more or less general all over, it attacks best, medium, and inferior plant indiscriminately, pruning high or low is all the same to it in its ravages, and unless a remedy is found it may become serious. I note a gradual increase of it yearly ; as it interferes with outturn, something must be found out about it, at present no one can state a cause for it. Could the Agricultural and Horticultural Society do anything for us? I could send them an affected plant complete for inspection. A remedy for the blight is most urgently wanted.

In continuation of this subject Messrs. Bird & Co. forward their Manager's replies to some queries suggested :—

No. 1. *Question.*—Does the blight attack solitary plants, certain areas, or the whole garden?

No. 1. *Answer.*—Very seldom solitary plants, of course it begins on one, and in the space of three weeks thirty to forty bushes grouped will be suffering from it ; and the surrounding plants quite free from it. Groups varying from five to as many as sixty bushes are to be found over all the garden.

No. 2. *Question.*—The age of the plant ?

No. 2. *Answer.*—25 down to 15 very badly attacked.

15 , , 9 not as heavily.

9 , , 3 lightly, groups of five.

3 to pullies, rarely.

No. 3. *Question.*—Class of soil most liable to attack, and lay of land ?

No. 3. *Answer.*—Any soil seems to suit as there is soil varying from rich red loam through yellow down to the blue

of potanh land, which may be flat with no drainage and high well drained, the latter comprises the greater portion of Tingri, say 75 per cent., medium 20 per cent., and low 5 per cent. of the whole.

No. 4. *Question.*—Season of appearance and weather?

No. 4. *Answer.*—End of July and beginning of August with heavy rains and occasionally hot blazing days, after one or two of which the blight begins by the edge of the leaf getting black, which gradually spreads till a fringe of green is left on top, the under leaves being withered of a brown color with a perceptible white thread on them which extends to the stem, or stems of the bush..

No. 5. *Question.*—Does it attack same plants or areas yearly?

No. 5. *Answer.*—No, I have marked down several bushes of three successive years' attacks and have not found it attack two years in succession the same plant (and it is as well it does not.)

No. 6. *Question.*—Attack a gradual or simultaneous one?

No. 6. *Answer.*—The attack goes on for a month appearing in several places at the same time, after the first month is over to the blight seems not to spread further.

No. 7. *Question.*—Answered under No. 2.

No. 8. *Question.*—Effect of heavy rain?

No. 8. *Answer.*—Heavy rain if continuous checks its spreading till the first day's sun sets it agoing, after second week from its appearance rain or sun have no effect, either way it simply runs its course.

Additional.

Manuring has no effect upon it, as it is to be found in the Hybrid near the Coolie lines, possibly as well manured Tea as could be found.

Pruning down does not root it out entirely but considerably reduces its ravages, but then these same low pruned bushes gradually get more and more of it as they are pruned up year by year.

It began here six years ago on a piece of old Tea near the river Tingri, then striking some eight or ten bushes in one group only, now there are groups equal to at least ten acres or 2,400 bushes attacked by it, the rate of increase to this having been gradual.

Class of plant.—It attacks all sorts of *jat* indiscriminately China, Hybrid, and Indigenous, goes even to the forest seed gardens, and lays hold of those (30 feet high,) seed trees which are growing in their natural soil and condition, with the same ease as it strips a China bush of 1½ ft. high, three feet plucking surface.

That is about all I know of this *Wither Blight*, and my notes are from experience of it for the past six years.

Mr. F. P. Hainworth, of Debrishur, in allusion to Messrs. Bird and Co.'s communication which appeared in the Proceedings for October, says:—"I would like to know in what Garden it is to be seen. I have an idea that it is no blight, but a white thread-like Parasite that creeps all over the leaves and branches of the Tea, and causes the bush to appear as though it were withering away; it requires pretty close observation to find it out. I had a quantity of it in the gardens under my charge when I first took them over, but by cutting out year after year I have got rid of a very great deal of it. I find it most near the jungle round the skirts of the garden, and in damp shady places." Mr. Hainworth's description corresponds with that given in answer No. 4, and a copy of his letter has been sent to Messrs. Bird and Co., who forwarded it to their Manager and send his reply:—

I am sending you to-day by sample post, shoots or branches from three blighted bushes, and trust they may reach in such order as to pay examination, each has its history wrapped round it.

"Tea Planter's" remarks refer to this identical blight, but I told you in mine of 12th ultimo, what little effect cutting down had upon it.

On the first appearance of "blackened" leaves, I have examined the bushes affected down branches, stem and roots, and could find no trace at any time of the white thread-like parasite which afterwards appears, and which I believe to be the outcome of the original attack of wither, this opinion is open to consideration as I note the parasite after showing does not run down the stem, but up the shoots that are giving leaf, and displays a sort of frost upon the leaves which die. The white thread runs to within 10" or 12" of the ground, and to get rid of it by cutting to that wants some thinking over.

My opinion is that some atmospheric influence has to account for the leaf getting black in the first instance, the bushes attacked being ready to receive the same, just as a run of any epidemic will select its victims promiscuously and the only remedy I can see, and it may be worth a trial, is to have the bushes attacked stripped of every leaf on the first sign of "sickness," so that if the parasite has been created it may die from want of food, it is evident it is not migratory, else why should it group so? With these remarks I close on wither blight for the present.

[Further communications on this subject are invited.]

*The Lac Insect (*Coccus Lacca*), and how I propagated it at Burhee, in the District of Hazareebagh. By MONSIEUR CLAUDE JEAN DUMAINE.*

SOME years back, in one of the villages I had in farm near Burhee, there was a small forest of only parras trees (*Butea frondosa*), which were being cut down for firewood.

As a mere past time, I thought of making use of them for propagating the Lac Insect, which proved successful.

Having found at a short distance a tree covered with the said insect in the month of July, when the rains had well set in; I had the large branches of this tree cut with a

sharp instrument, so as not to disturb the living insect by hacking the tree.

These branches were at once taken amongst the parras forest and sub-divided in pieces varying from six to eight inches long, which twigs were immediately tied to the tender branches on the windward side of each tree. The natural result was that when these twigs dried up the insects took at once to the adjoining branches and subsequently covered the tree.

As a mere experiment, I tied some of these twigs on the opposite side of the tree, but this proved a failure as no insect was found on it. I naturally concluded that when the insects left the old twig, they were driven by the force of the wind to some adjoining arbor.

I found to my dismay that my trees were being cut for fire-wood by wood-cutters.

Knowing the natives habits, beliefs, and prejudices, I was able to put a stop to the destruction of my small forest.

I procured some red lead mixed it with oil into a thin paste, and on the most exposed part of each tree I had two perpendicular strokes made side by side, each being two inches long. This had the desired effect, from that day my trees were never touched, these being the symbolical marks in that part of the country that some evil spirit had chosen that place for its residence, and nothing in the world will make to cut them down, as they strongly believe that in doing so the evil spirit who is thus being dislodged, will haunt and some time kill them.

The following is a list of the principal trees on which the Lac Insect is found :—

Kussoom	...	Schleichera trijuga, Wild.
Parras	...	Butea frondosa.
Bur	...	Ficus Bengalensis.
Peepul	...	Ficus religiosa.
Pakur	...	Ficus infectoria.
Plum tree	...	Zizyphus jujuba.

CULTIVATION OF THE VINE IN KASHMIR.

(*From the DEWAN LAKHPAT RAY, Secretary to His Highness the Maharaja of Kashmir.)*

JAMMOO, 5th February 1885.

IN continuation of my letter No. 90 of the 17th September last, promising to furnish you with a report on Viniculture in Kashmir, to be published in the Journal of your Society, I have the pleasure to forward you the same as follows :—

(2). From time unknown Kashmir has been renowned for her fruit, and her indigenous kinds of Grapes, known as Black, White, and Kishmish, or Bedáná, sweet enough for table use, as well as to ferment into a good wine, which is said to have enjoyed a good reputation by the ancient travellers. In the year 1878 Mons. Ermens, a Belgian traveller, happening to come to the "Sweet Valley," found the suitability of her soil and climate for the growth of the European kinds of Grapes, for which Italy and France hold a dignified position in the world; and he expressed his desire of introducing new varieties of Grapes from France, and establishing a Wine Manufactory on the European system, to His Highness the Maharaja of Kashmir, who being a man of noble and high understanding, whose treasury is always open for any proposal that pretends at least to do good to his country and to his people, accepted the traveller's offer, and employed him at a liberal salary for a period of five years for the purpose.

(3). Mons. Ermens for the first time introduced into Kashmir the several varieties of the European Grapes, which are now growing very luxuriantly in the Valley. A separate nomenclature of the Grapes has been given *in extenso*.

(4). Last year Colonel Sir Oliver St. John, c. s. i., the Officer on Special Duty in Kashmir, very kindly introduced the following kinds of Shiraz Grapes from Persia to

Kashmir, *viz.*, "White, Black, Agghurrie, and Black fibred. They are unlike the European kind very hardy, they require neither trellis nor irrigation, they can thrive well in a hole in a disintegrated rock.

(5). To give you an idea of the expenditure and outturn of the Kashmir Vinery, I give you the following items of cost and production of an acre of land :—

Cost for cultivating an acre of Vine, 825 Plants per acre.

		Rs.	Total Rs.
FOR THE 1ST YEAR—			
Cost for purchasing land	...	50	
" " making 825 holes	...	80	
Price of 825 poles for trellis	...	130	
Establishment	...	72	
Supervising Establishment	...	80	
Manure	...	30	
Irrigation	...	20	
Miscellaneous	...	8	
		<hr/>	<hr/>
SECOND YEAR	...	182	470
THIRD YEAR	...	182	
FOURTH YEAR	...	182	
		<hr/>	<hr/>
Total Expenditure	...	546	
		<hr/>	<hr/>
		1,016	

Annual outturn from the 4th year, 5,625 lbs. of Grapes, valued at 1 anna per lb.

192 lbs. of Grapes make 9 imperial gallons of wine.

N. B.— After fourth year there is no expenditure except pruning the plants and gathering the fruit (Grapes.)

(6.) *Utility of the different kinds of Grapes :—*

Semillion	...	... } used in manufacturing
Saurrignon Saunterne	...	... } white wine.

Cabernet Saurrignon	...	}	used in manufacturing red wine.
,, Franc	...		
Verdot	...		
Merlot	...		
Malbec	...		
Gamais	...		
Chasselas	...	}	Table Grapes.
Muscat	...		
Francental	...		
Blanc de Courtellon	...		
Malgas	...		
Muscat Rose	...		
Chasselas Rose	...	}	
,, de Fontain bleau	...		
,, de Jerusalem	...		
,, de Vitis Villora	...		

(7.) There are two French gentlemen employed in the Vinery, Mons. Boulay, the Gardener to look over the gardens, and Mons. Pechaud, the Distiller and Cooper in charge of the Wine Department. Both of them are very expert in the respective duties they are entrusted with.

Name of Gardens and number of Plants in each Garden.

1. CHASHMA SAHI GARDEN, OLD PLANTATION—

Semillion	...	...	16,000
Cabernet Saurrignon	...	...	16,000
,, Franc	...	...	16,000
Verdot	...	...	1,500
Saurrignon Saunterne	...	...	5,000
Table Grapes	...	...	1,000
		—	55,500
		—	55,500
	Carried over	...	55,500

	Brought forward ...	55,500
CHASHMA SAHI GARDEN, NEW PLANTATION—		
Cabernet Saurriguon ...	... 12,000	
Semillion ...	... 4,000	
Gamais ...	... 500	
Malbec ...	... 500	
Merlot ...	... 500	
	—————	17,500
2. THIRED GARDEN—		
Semillion ...	... 30,000	
Cabernet Franc ...	... 20,000	
„ Saurrignon ...	... 20,000	
Saurrignon Saunterne ...	... 20,000	
	—————	90,000
3. NISHAT BÁGH—		
Semillion ...	... 30,000	
Cabernet Franc ...	... 25,000	
	—————	55,000
4. HAZRAT BÁGH—		
Semillion Saunterne ...	... 4,000	
Semillion ...	... 10,000	
Cabernet Franc ...	... 20,000	
„ Saurrignon ...	... 10,000	
	—————	44,000
5. WATE BÁL GARDEN 30,000		
6. DUBGÁON 50,000		
7. PRINCE'S GARDEN 8,525		
8. DEWAN'S „ 2,000		
TOTAL PLANTS 352,525		
	—————	

I remain,

Dear Sir,

Yours truly,

(Sd.) DEWAN LAKHPAT RAY,

Secretary to His Highness

the Maharaja of Kashmir, &c., &c.

(Sd.) SRIS CHAND DUTTO,

Head Assistant.

The Tusser Silk Worm (Antheraea Paphia, Linnaeus,) and how I reared it at Burhee, in the Hazareebagh District.

BY MONSIEUR CLAUDE JEAN DUMAINE.

DURING my stay in the Hazareebagh District, having at my disposal about quarter of a square mile of jungle close to my house, I resolved to experiment personally in the art of rearing the Tusser worm.

Seed Cocoons.—In the latter end of May I purchased seed cocoons and, guided by a practical man, picked out the ones containing female moths, as those containing males are useless.

The cocoons containing female moths are, as a rule, larger, and the two extremities are pretty equal and much rounder at the end than those of the males, then again the safety cord by which they are attached to the branches are much thicker and generally proceed from one side of the cocoons.

The cocoons containing males are always smaller, and one of the extremities is more pointed than the other, the safety cord is thin and generally starts from almost the top of the coeooon.

The next step is to satisfy oneself that the chrysalis is alive which can easily be found out, not only by the weight but by the sound. The dead ones when shaken give a sharp rattling noise, and are also very light.

I tested over and over again the accuracy of these statements and found them to be correct. I then got green branches made bows of them, and threaded the string through the loop of the safety cord, six to eight cocoons were put on each bow, and hooks made of green branches tied to the bows, so as to be able to fix them where needed, this is the primitive but effective native system by which the cocoons can be kept safely and out of harm's way.

Breeding.—About the 20th June when the rains had well set in as customary, I hung these bows in my verandah and examined the cocoons. Generally at about sunset the head of the

cocoons are moistened by the liquid secretion from the mouth of the insect, this is the sign the moth will soon come out, after candle light from 7 to 8 p. m., the moths come out and cling to the sides of their respective cocoons. It takes them about half an hour to settle and stretch their wings, when the males only fly away and not being needed are allowed to do so.

At 8 p. m. I had all these bows taken out and suspended to a string stretched in the open air across my compound about six yards from my house, so that the females could, while clinging to the side of their cocoons, be visited by the wild males.

The native way is to hang the bows under the trees, the advantage of which is that they are more protected from the attack of the night birds than when on the string, but on the other side run great risks of being destroyed by ants and rats, and often are found neglected by the males in consequence of their seclusion.

To remedy the only defect there is in my method, I used to keep men on the watch, a great expense unless you have a large quantity of moths.

To satisfy myself that it is a mistaken supposition on the part of natives, that the escaped male moths never returned to the place, I had several distinctive marks made on the males that emerged from my cocoons in the evening before they had time to fly away, and found that they returned not only the next morning but many following ones.

At 3 to 4 A. M. as customary, I used to go and examine my female moths and satisfy myself that each female had a male, and for those that had none wild males were caught.

It is a well established fact that a female moth that has not been visited by the male the day she comes out from the cocoon before dawn, will never be approached by one again; so that female is a loss to the person rearing it.

I was no little astonished when I visited my moths in the morning to find a great number of spare male moths, flying

round and round the females, in fact they were troublesome, but the minute day-light is seen they all vanish.

At this period, as usual, I had all these bows taken into my house and suspended in a room, keeping them away from the wall as protection against ants and rats.

The females and males remained together the whole day till sunset, that is, about 24 hours from the time they emerged from the cocoons.

The males then leave the females and fly away, which they are allowed to do.

The females, if not immediately secured by clipping the wings, will fly away also.

The Eggs.—The female moths are then put in places where the eggs are to be laid.

The native methods are to put two or three in each *pouche* made of *sabay* grass, measuring about 18 inches in length by six inches in diameter, closed at both ends, the lower part rounded and the top pointed, the straws being about $\frac{1}{4}$ of an inch apart.

The advantage of these *pouches* are that the moths are well secured, and they save much trouble in looking after the eggs, when the time of hatching comes the pouches are simply attached to the trees where they are to be reared, and the worms do not run any risk of being drowned or eggs spoiled, if, as often takes place, a shower of rain should come before the eggs are hatched or the worms have all left it. On the other side the loss of eggs must be great as they are often laid just between two straws, or washed off by the rain, but the natives do not seem to care much for such losses.

My method was to put the females into a box previously lined with paper, the top part being open. I treated them in three different manners.

In the first box measuring inwardly about $18 \times 15 \times 6$ inches I put six females, I left these moths undisturbed till they died on the 5th day after laying their eggs at pleasure.

The result was that the eggs produced about one-third of good strong worms, then about half of the remainder gave most weak and sickly worms; and out of what was left many eggs never hatched, and a number of worms were hardly able to creep out of the eggs, and died.

In the second box I doubled the number of females, which were still far from being crowded. I took up the eggs which were laid the first 24 hours, and every worm hatched, some however, being sickly.

This proved to me clearly that the sooner the eggs were laid the better, my guide had also told me so, and the following is the way I employed.

It is well known that when laying, the moths spin round and round flapping their wings all the time, and when at a standstill, they can be forced to renew the spinning round and round and laying, by simply touching them with the finger.

The third box I purposely overcrowded with moths, calculating that amongst such a number there would at least be a few that would always be laying, and when doing so they would touch the adjoining moths which would commence spinning afresh and naturally cause the undisturbed ones to do the same, so that all the eggs would be laid within a short time, which is most desirable.

Next morning that is 12 hours after, I removed these moths into another box which we will call No. 4, and allowed them to remain unmolested for 12 hours more, keeping those eggs separately, and then again removed them to another one which we will call No. 5.

The eggs which were laid in box No. 3 gave good worms and all hatched.

In No. 4 box there were hardly any eggs which gave indifferent kind of caterpillars.

In box No. 5 there were but few eggs, many as usual did not hatch at all, others were not worth keeping.

In Experiment No. 3 the moths died in three days which in

Nos. 1 and 2 box they lived up to five days. Each female lays from 350 to 400 eggs.

The Field.—Before going any further I shall describe how the field covered with trees on which the worms are feed, is prepared in the usual manner.

1st.—All useless trees and brushwood are cut down ; 2nd, all the lower branches of the useful trees are also cut till about three feet from the ground, as well as those branches which touch adjoining trees ; 3rd, the trunk of the trees must be well exposed ; 4th, all dried leaves and grass are removed in fact the place is made as clean as any garden, so that the man in charge can at a glance see the worms are not molested.

The only trees I tried to rear my worms on were the *Shorea Robusta* (*sal*, *sakooa*), and *Terminalia Tomentosa* (*Assun*), in fact these are the principal ones used for that purpose.

The Rearing.—The eggs having been laid in boxes, I detached them with an ivory paper slice, and then kept in boxes till the evening of the 8th day. I then had pouches made of green leaves, taking the precaution of making two or three small holes in the lower part so as to allow the water to run out should a shower come on. The first time I did it I made no holes, and the natural result was that all my worms were drowned and eggs spoilt.

This leaf bag or pouch I attached to the trees where the worms were to be reared, on the evening of the 8th day. On the morning of the 9th day the eggs hatched, and the trees were at once covered with small Caterpillars, about $\frac{1}{4}$ of an inch long and $\frac{1}{8}$ part of an inch broad, they were rather hairy and of a dark colour.

The natives attach the pouches to the lower branches of the trees, so that the worms go upwards, and when they have eaten up all the leaves they being on the top of the trees, the keeper has to climb up and hold fresh branches with leaves where the starving worms are, keeping it there till the worms are on them, and then hand it to another man who ties it to adjoining trees.

This operation is risky, troublesome, and expensive, and many hands are needed.

My method was the same so far as removing the worm from one tree to another, but the day the eggs were hatched, I attached the pouch to the tops of the trees, where young worms not only had the tender leaves to feed upon, but when they had done eating the leaves, they had arrived at the lower branches within easy reach of the keeper, who without any risk removed them as above described, one man being able to do as much as ten by the native method.

The worms feed $2\frac{1}{2}$ days and rest or starve for $1\frac{1}{2}$, and before commencing to feed again they fix their skin to the branch and crawl out of it, which skin they devour and then take to the leaves. This they continue for 45 days, and at each operation the worms get not only larger but change colour till bright spots of silver and gold glitter in the sun. The morning of the 46th day the creature spins her cocoon, which takes her two and half to three days. These cocoons containing females are kept for seed, the male ones are put in hot water to destroy the vitality of the chrysalis and then kept for sale.

They remain in their cocoons for fifteen days when the whole process above detailed must be done over again; but when they spin a second and last time for the season, the cocoons are allowed to remain on the trees three to four days to get seasoned, as the harder they are the better, when they are collected and sold to merchants.

From the day the moths come out from the cocoons for the first time, to the time they are collected off the trees for sale at the end of the second and last crop for that year, there is a lapse of 184 days.

The revenue paid to the zemindar for the use of the trees vary from Rs. 3 to Rs. 4 per keeper, who can have two or three boys to help him.

The Cocoons.—The cocoons reared on the *Terminalia tomentosa*.

(*Sal*), are smaller but harder and said to contain more silk. Those found on the *Zizyphus Jujuba* are still smaller and harder and said to contain as much silk as any, but this I cannot vouch for, as I had no opportunity to satisfy myself on the subject.

The Enemies.—Before ending I must state that it is a known fact that the silk worms have enemies ready to eat or destroy them from the time the moth comes out from the cocoon, and even when in it in its wild state.

While the moth is still hanging to the cocoon from which it has just issued, the night birds, bats, flying foxes and rats, attack them, as well as ants.

When in the eggs, ants make short work of them, and in fact at all times.

When they turn into worms they are attacked day and night by birds of all kinds, carried away by rats, snakes, Spanish flies, and wasps and other insects sting them to death. There is a kind of an insect which has a long proboscis which it fixes in the worm and literally suck up all the inside. On one occasion having nothing wherewith to catch it I tried to kill it by pressing it between two leaves, I was stung in the top of the middle finger, and before I had time to drop it I felt the pain right up to my shoulder.

This insect destroys worms by the hundred, as it is often only takes a taste out of each worm it comes across.

The snakes make short work of them, and if they happen to fall off the branches toads eat them also.

Ants of all kinds as I already said never let them escape when they have an opportunity.

When they have spun their cocoons and are hanging to the branches in their wild state, there is a bird with a strong parrot-shaped beak which cuts the cocoons and eat the chrysalis.

The number of eggs that are hatched must be very great, for after the inroads made by so many different kinds of

enemies that swarm in the jungles, to still leave the millions of millions of cocoons which are sold for the silk trade.

The superstitions, or rules of purity, as the natives call them.— I will now give a short account of the various beliefs of the natives who rear the worms.

1st.—They must make new cots or charpoys to sleep upon, their old ones being considered unclean.

2nd.—When once the eggs are hatched they must never leave the areas covered by the trees on which the worms are to be reared.

3rd.—They must not see their wives.

4th.—No woman nor girl must enter the spot chosen by them in the jungles.

5th.—They must bathe twice a day.

6th.—Must never shave or cut their hair.

7th.—Their meals must be taken to them by some boy or man, and must be placed just on the border of their cultivation, where they will eat and leave the plate to be taken away by whoever brought it.

8th.—Cattle of all kinds must not trespass on the chosen spot.

9th.—They must not wear shoes.

10th.—They must not eat fish.

These are some of the laws laid down by their ancestors, and they strongly believe that if they break through any of these rules their punishment will be the total loss of their crop.

As a reward, they have been given the hope that they will after many years, by acting as told and persevering in the trade, find that some of their cocoons have turned into lumps of gold.

I have in vain tried to argue with them and open their eyes, by explaining that the person who made these rules knew full well the worms required their presence day and night, and to compel them to be always in attendance laid the above rules

which have the desired effect ; and as for the hope of getting the golden cocoons, it was but a figurative way of telling them that by continual attention to their work and perseverance in spite of all losses they may have during the years of short rain fall, they will at the end get a small fortune.

But all my arguments went for nothing.

List of trees found in the Hazareebagh Jungles on which silk worms can be reared or are found in their wild state.

	Botanical names.	Country names.
1	Terminalia Tomentosa	... (Assun.)
2	Shorea Robusta	... (Sal.)
3	Terminalia Belerica	... (Baheera.)
4	„ Chebula	... (Harra.)
5	Buchanania Latifolia	... (Piar.)
6	Ficus Infectoria	... (Pakur.)
7	„ Religiosa	... (Peepul.)
8	„ Glomerata	... (Goolur.)
9	„ Bengalensis	... (Bur.)
10	Bombax Malabaricum	... (Seemul.)
11	Carrissa Carandas	... (Karrunda.)
12	Bassia Latifolia	... (Mowha.)
13	Anogeissus Latifolia	... (Dhorn Dhonta.)
14	Schleichera Trijuga	... (Kussum.)
15	Zizyphus Jujuba	... (Bair.)
16	Terminalia Arjuna	... (Arjoon.)
17	Terminalia Catappa	... (Baddam.)
18	Symplocos Racemosa	... (Lodh.)
19	Artocarpus Integrifolia	... (Kantal.)
20	Anthocephalus Cadamba	... (Kadam.)
21	Gmelina Arborea	... (Gamar.)
22	Dillenia indica	... (Chalta.)
23	Lagerstromia Parviflora	... (Séd or Sedah.)

I have no doubt that there are great many more on which

the Tusser could be reared as well as other wild silk spinners, such as the *Attacus Atlas* and other kinds of *Antheraea*. But in the Hazareebagh district and adjoining ones the only one reared is the Tusser, and the principal tree is the *Terminalia tomentosa (assun)*, probably because it is more plentiful, as the tree gives but a second class wood for building the natives do not care to cut it as they do the *Shorea Robusta (Sal)* on which the worms also feed.

The rule, so far as I can see, is the less you have to take the worms from tree to tree the better, must never touch the worms with the fingers, and the deeper is the jungle the larger and harder are the cocoons, so one must go in jungles far away from large towns to rear them profitably.

I resided for 15 years at Burhee, in the Hazareebagh district, and made the silk culture in the open air a pleasant pastime and study.

I visited the adjoining districts of Singbhook, Manbhook, Lohardugga, Palamow, and spent six months at Soorjoogah, passing by Mirzapore, Singrowlee, and Rewah districts; in all these places the Tusser cocoons abound, and I have not the slightest doubt that a very profitable business could be carried on by renting at a nominal cost the vast tracts of jungles, and engaging a suitable number of men to carry on a large rearing establishment.

The great advantage one has is that in making use of the jungle one has no expense in cultivating trees, the worms have also abundance of fresh leaves to feed upon, which is not the case in rearing the ordinary *Bombyx* for whom quantities of land must be planted with mulberry trees and kept up as an enormous cost and risk, as well as other well-known drawbacks.

Very large quantities, say the entire crops of several districts, could be secured by making arrangements with the breeders. It is a known fact that every year *junglees* are compelled to abandon the trade simply from want of money,

having to wait five months to realize the value of their crops.

I shall be glad to give any information on the subject of rearing the worms, and also undertake to purchase Tusser cocoons, silk or cloth to any quantity.

CLAUDE JEAN DUMAINE.

CHANDERNAGORE, 8th March 1885.

THE EFFECTS OF ENSILAGE ON MILCH COWS.

A SERIES of carefully made experiments with feeding milch cows on ensilage were instituted by Brigadier-General H. C. Wilkinson, who has kindly placed the results at the disposal of the Society.

Four cows were chosen from a milk supplier's regular herd, two were placed on green grass rations and two on ensilage, the same quantity of grain being given in both cases, and an equal weight of fodder, about twenty seers.

Cows Nos. 1 and 4 were put upon grass, and cows Nos. 2 and 3 upon ensilage. At the end of a month Nos. 1 and 4 were put on ensilage and 3 and 4 on grass : in each case the result was the same, those fed upon grass when transferred to ensilage gave an increase in the quantity of milk, as well as a corresponding increase in quality as shown by the lactometre, while those fed on ensilage when transferred to grass gave a decreased supply of milk, and that of a poorer quality. The figures in the table appended speak for themselves. They show between the two cows fed on ensilage an increase of over 28 seers of milk in as many days, and for the two fed on grass, a decrease of 80 seers of milk in 28 days, a loss equivalent to one-third of the yield of the two animals. While giving an increased yield of milk, the two cows fed on ensilage showed also an increase in weight of several pounds, an increase which would undoubtedly have been more marked

had the animals not been milch cows, but been merely fed for fattening.

General Wilkinson took the opportunity when the opening of some silos in the Transport lines, Hastings, had collected a number of gentlemen interested in the subject, to exhibit milk, cream, and butter, all made from the milk of ensilage-fed cows, they were perfectly free from any taint or flavour of ensilage, and were exceedingly good rich samples of a quality not procurable in the market.

Table showing the fattening & milk yielding properties of ensilage compared with grass.

Number of Cow.	Food.	Date.	YIELD OF MILK.			Quality of milk.			
			Weight of Cow.	Total.	Increase.	Decrease.			
							Loss in lb.	Gain in lb.	Loss in lb.
No. 1	Grass	1884.	3½	154	5	...	...	...	5½
		1st November	28	...	16	...	9	3	8½
No. 2	Ensilage	1st December	28	16	...	146	15	...	9½
		1st November	28	...	...	114	10	...	32
No. 3	Grass	1st December	28	51	...	166	14	...	7
		1st November	28	...	25	119	3	...	10
No. 4	Ensilage	1st December	28	...	11	116	8	...	8½
		1st November	28	...	23	136	0	19	11
		1st December	28	...	23	136	0	19	12

Correspondence and Selections.

LIQUID MANURE.

*From Journal of Horticulture and Cottage Gardener for
30th October 1884.*

EVERY gardener knows the value of Liquid Manure. In the hands of the experienced it is an important aid in the cultivation of flowers, fruit, and vegetables, whilst in those of the inexperienced it is one of the most uncertain in effect, yet by its timely and judicious application results are achieved which a few years ago would have been considered unapproachable without a considerable extension of the rooting area. Of flowering plants we have more useful and more floriferous specimens in 6-inch pots than we formerly had in 9 or 12-inch. Its use has quite revolutionised our ideas in respect of plants grown for decorative purposes. Then in fruit culture large borders have given place to borders of limited extent, rich soils have been supplanted by those more likely to encourage root-action, and which are porous through the presence of inorganic substances.

Further, as regards vegetables the use of sewage, aided by mulching, has rendered us safe from famine through drought, and we have attained an excellence in products much in advance of previous results. Instead of filling the ground with manure much in excess of what would be needed for the sustenance of the crop in an ordinary season, we trust more now to meeting emergencies as they appear by the prompt application of manure in a liquid form, and the evil effects of drought are avoided by watering and preventing evaporation by mulching. Artificial manures also assist us greatly, as they may be applied as surface dressings in frequent small doses, yet they would be ineffective were it not for the copious waterings following their application.

If the object of the cultivator is to secure the largest size of plants with the finest foliage, the largest head of bloom and finest flowers in the smallest pots in the least time, he must give Liquid Manure before the soil is exhausted of its virtues, and continue to give it as long as the plant remains in the pot. Thus a sturdy vigorous growth is maintained from the first, and up to the flowering or, with foliage plants, until they are of a suitable size for decorative purposes. Thus we see Primulas, Cyclamens, Cinerarias, Pelargoniums, and Fuchsias in 5 or 6-inch pots superior in size, health, and flower to what were only

a short time ago grown in pots 2 to 3 inches larger in diameter. What is true of flowering plants is equally true of variegated and foliage plants, also to the freer rooting and softer growing hard-wooded plants. In growing the latter we have wonderful examples of cultivation from the judicious application of cool manures in liquid form through all the stages of growth up to the flowering.

Soft-wooded *Ericas* and *Epacries* are obtained in small pots, large in head and splendidly flowered, by superior cultivation, but if they have nothing but water after the flowers expand, the plants are so exhausted that they do very little good subsequently. This is equally the case with soft-wooded plants; they are fed so as to afford a fine head of bloom out of all proportion to the pots they are grown or flowered in, and the plants are never so fine again. Such plants are grown specially for market, they are disposed of and thrown away after they have served the purpose intended. The wonder is not why it should be so, but rather how it could be otherwise. To continue the vigour of the plant after this stage is reached is thought by some to be impracticable. They change hands, are placed in conservatories, greenhouses, or employed for decorative purposes indoors. There is a sudden and complete cessation of the high cultivation, and the plants soon exhibit signs of weakness and ill-health. But there is no reason why a well-fed plant should not by continuing the treatment be healthy and vigorous for years after attaining to a suitable size. Evidence of this we have in exhibition plants; the same old staggers take and keep their places year after year as certainly as the Shows. Therefore, I would point to the fact that when a specimen deteriorates it is due entirely to a withdrawal of the high culture to which it had previously been subjected. If much weakened no care or culture will restore the former vigour, but if the only effect on the health is due to the flowering good treatment will render them as useful as before.

The time for applying Liquid Manure to plants in pots requires some consideration. The time not to apply it is when a plant is newly potted and has no roots in the fresh compost, and when it is in a dormant state or resting. The time to apply Liquid Manure is when a plant has active roots, when the flower buds are forming, and when they are expanding. Liquid Manure can never be given wrongly at those times. When a plant is growing strongly in plenty of light and air, and flower buds are showing, the roots will take almost any amount of nutrition, which in the case of soft-wooded plants will need to be continued until the flowering is over. In the case of plants that make growth and set the buds and then rest awhile, the liquid will only be required until the growth is made, as, for instance, *Camellias*, *Azaleas*, &c., and through this stage liquid may be

given, but at the resting time Liquid Manure is not necessary, or only in the case of weakly plants with a heavy crop of buds, and then in moderate quantity. When the buds take the next swelling or for flowering, the roots, if the plants are healthy, push active feeders, and these feed the swelling buds and expanding flowers, new growths issuing soon after flowering or in vigorous examples with them. If the manure is to be of any use it must be when the plant has an active root-action. Applied when the root-action is dormant, Liquid Manure will not do much good beyond enrich poor soil; but it may do great injury by gorging the soil with aliment which stagnates and destroys the roots. This is a common case with Camellias from an excess of water alone; the roots are lost during the resting season, and the buds fall when they should be expanding.

There are cases when Liquid Manure may be given at almost any stage of a plant's growth, provided the foliage be fully exposed to light. I allude to plants kept in continuous growth and flowering, such as Gardenias, Tree Carnations, Eucharis, and Stephanotis.

Liquid Manure must be given to plants in accordance with their health. Weakly plants will not take such strong supplies as those which are vigorous, and it must be given less frequently. It is not considered desirable to give Liquid Manure to weakly plants, but these must have assistance if they ever are to become healthy. Poverty of plant is from poverty of soil. Starved roots can never support a vigorous plant, and if any plant need Liquid Manure it is the weakly and ill-conditioned. It is no use giving Liquid Manure to a plant that has bad foliage from lack of roots, but it is another thing to give it to a plant starved in a small pot full of hungry roots. Further, Liquid Manure should be given weak; when too powerful it destroys the roots, and it should not be supplied too frequently. A plant in the early stages of growth after potting will not only require the liquid weak, but less frequently than when the roots are more abundant and the plant much advanced. As a rule once or twice a week is a safe practice until the plants are in free growth, and afterwards it may be given at each alternate, or, if more vigour is needed, at every watering. Whenever it is given it should be thorough—as full and complete as a supply of water, sufficient to fill the soil.

Liquid Manure should always be employed of a known strength. No haphazard system must be followed, and although manures vary in strength and may be different in chemical constituents, those of the same kind are not so variable as to be unsuitable for practical purposes. I allude to solid manures, which when mixed with water are most suitable for pot plants. The drainings of stables, cow sheds, &c., are good, yet vary so much in strength from the water that finds its way into the

cesspool, either from rain in the case of open tanks in yards or washing out of the trenches in stables, as to be very variable, and require great judgment in their employment. As a rule this form of Liquid Manure will mostly need to be diluted with six times the bulk of water, and in using the drainings of the stalls one part to twelve of water is quite strong enough, but the Liquid Manure tank is best left alone as regards watering choice plants with it, reserving it for the coarser or grosser-feeding plants or crops. Liquid Manure should always be applied at a temperature equal to the mean of the house in which the plants are growing, or a few degrees warmer.

Soot is undeniably the best manure for plants in pots. It should be kept dry, as damp spoils it, and putting it in a tub with water and allowing it to stand until wanted is not much better. If a large quantity be wanted put a peck in a tub, and enough water to form it into a paste, then add thirty gallons of water, and apply at once, stirring well before each dipping of the watering pot. Another plan is to put as much soot as is considered will be wanted in a watering pot and form it into a paste with water by stirring with a stick. Pour about a wine-glassful into a gallon of water or more, according to the size of the can, and apply to the plants. For giving colour to foliage there is nothing to equal soot, giving the leaves a deep green gloss not to be obtained from any other manure that I know.

Guano, when good, is first-rate, Peruvian being the best. Place 1 lb. in a tiffany bag, and immerse it in a tub containing twenty gallons of water, then move it about until nothing is left in the bag but the insoluble matter, and apply at once. If only small quantities are required put as many ounces in a tiffany or muslin bag as the watering pot contains gallons, and move it in the water until it ceases to give out more colour than that of the liquid outside the bag in the can. It is then fit for use.

Pigeons' dung, at the rate of a peck to thirty gallons of water, is a powerful fertiliser. Place it in a tub, stir well, every six hours for a day, let stand a night, then stir again, strain through a hair sieve or bag and use. It will save trouble to place in a coarse bag in the first instance. For plants not in a vigorous condition it must only be used at half the above strength, and is only available for soft-wooded plants. Fowls' dung is equally effective. Sheep droppings, when they can be had, may be used with advantage, and is prepared similarly to the above, with the difference that it is well to pour some boiling water over it to submerge it. This liquid being cool is well suited for hard-wooded plants, as Camellias, Azaleas, and similar plants. Horse droppings may be used, but twenty gallons of water is ample for a peck, and cow dung is perhaps the safest of all. The cow dung should be fresh, and have boiling water poured over it to destroy the larvae that harbour in it; and twenty gallons of

water is sufficient dilution, and is admirable for every description of plant, more particularly for those that are naturally slow-growing, have hard wood, and delight in a cool moisture-holding soil, hence it is available in preference to all others with fine hair-like fibres, as Heaths and all peat loving plants.

Sulphate of ammonia may be used at the rate of half an ounce to the gallon of rain-water to plants that have plenty of roots, and should not be given more frequently than twice a week; but it is safer to use it at half the strength—viz., quarter ounce to each gallon, and apply more frequently. This is perhaps one of the best manures for plants grown for their leaves, and is more especially useful for Chrysanthemums, and Fuchsias. The ammoniacal liquor from the gaswork is also serviceable, employing a pint to three gallons of water, and superphosphate of lime at the rate of 1 lb. to twelve gallons of water may be used similarly. The nitrates of potash and soda are good where vigour or leaf-growth is wanted, as they promote luxuriance in a marked degree; but all such manures should only be given to plants that are strong-rooting, and not to delicate-rooted once.

In using Liquid Manures the best results are obtained by varying the applications—not employing one kind throughout, but alternating, as for instance soot for a time, then animal manure, and then superphosphate of lime, &c., and this course seems to act most beneficially on soft-wooded plants.—G. ABBEY.

PITHECOLOBIUM SAMAN.

Précis of reports on the results of the experiments made in the Bombay Presidency in the cultivation of the Pithecolobium Saman Tree.

COMMUNICATED BY THE REVENUE AND AGRICULTURAL DEPARTMENT.

A SUPPLY of seed of the Pithecolobium Saman Tree was first sent out to this Presidency by the Secretary of State for India in June 1878, and distributed for experimental cultivation in the districts in September 1878. The result of the experiment which was found to be satisfactory was reported to the Secretary of State in February 1880, and an application was made to him for a further supply of seed. None, however, was sent out from England, but at the suggestion of Lord Hartington ten pounds of the seed were obtained from Ceylon in October 1880. This seed was distributed to the Commissioners, S. D. and C. D., and the Conservators of Forests, N. D., S. D. and Sind.

2. The experiments made with the seed supplied to the Commissioner, S. D., and the Conservator of Forests, S. D., were unsuccessful. From the report of the former officer it appears

that though the seed was sown in almost all the tálukás of the Belgaum and Dhárwár Districts it germinated only in the Khánápar Táluká and Murgod Mahál of the former, and in Hubli and Bankápur tálukás of the latter district. In Khánápur four or five seeds only sprouted but died after a month. In Murgod only one seedling has been produced. In Bankápur and Hubli four plants are reported to be thriving. The seed sown in the Kaládgi and Kávara Districts did not germinate at all. The failure of the experiment is attributed to the badness of the seed, and the Commissioner, S. D., recommends that another experiment be made with better seed.

3. In Sind the seed was sown by Major McRae, in the Katri forest, near Meeanee. At present there are about 158 young trees from fourteen to twenty feet high, but judging from their condition the Acting Conservator doubts their succeeding in Sind.

4. It appears from the report of the Conservator of Forests, N. D., that the experiments made by the District Forest Officers in the Thána and Poona Districts completely failed; the seed germinated but the plants died almost immediately. In the Sholápur District the experiment did not fare much better, only three or four seeds having germinated out of a considerable number. The seed sown in Sátára germinated freely and the plants did well for a year, but heavy rains caused those on the hills to rot while those in the plains died from want of moisture in the hot weather. In the Kolába District six or eight saplings are reported to be alive. They attained a height of twenty-four feet within two and a half years, but have not grown since and look now sickly.

5. The results of the experiments made in the Násik and Ahmednagar Districts are reported to be promising. In the former district the seed was sown in December 1880, and in the following August the plants grew six inches high; 300 of them were put out into a plantation near Násik in March 1882, and though 30 per cent. of them were burnt up by the sun, new shoots sprouted in August 1882 from the old roots and the whole plantation is now in a flourishing condition. One hundred plants were raised from the seed sown in the Ahmednagar District. They were planted out at the commencement of the rains of 1881 and are growing well, being about two to two and a half feet high.

6. From the results of the experiments made by the District Forest Officers under him as well as of those conducted by himself in his garden at Poona, the Conservator of Forests, N. D., draws the following conclusions:—

- (a.) That the seeds ought to be sown in the cold weather;
- (b.) That the seedlings should be raised in pots and should be watered;

(c.) That transplantation should not take place until the commencement of the second rainy season when the seedlings will average between eighteen inches and two feet in height;

(d.) That no further care is necessary if the plants are in good deep soil with moisture present;

(e.) That they do not thrive but are apt to rot and die if they are subjected to a very heavy rain-fall during infancy; and on the other hand they cannot stand heat and drought at that age;

(f.) That the tree coppices well;

(g.) That it can be produced from shoots;

(h.) That it does not produce good wood, but a clear yellow gum exudes from the bark and the pods are useful for cattle food; and .

(i.) That the tree has great powers of condensing the moisture of the atmosphere during night time. (Mr. Fagan reports that he has seen moisture falling to the ground from off the leaves before sun-rise.).

7. Mr. Shuttleworth suggests that some of the trees now in his compound at Poona be planted out during the present rains in the marshy ground near the Ghorpadi barracks and their further growth carefully watched, and states that if the Military Department will undertake the work and provide the cost he will give young trees and will assist in the transplanting operations. The Military Department have been asked whether they would wish the experiment to be tried.

8. Mr. Shuttleworth adds that the *Pithecolobium Saman* has no advantages over the trees indigenous to this Presidency; it requires special care and nursing when young, and is not for this reason and also for economic considerations, adapted to operations of sylviculture; but it may be desirable to grow it on the sides of roads in marshy ground in cantonments and near towns, &c., where there may be any extent of water-logged low-lying lands.

9. The experiments made by the Revenue Officers in the cultivation of the seed in the districts of the Central Division were generally unsuccessful. Their failure is ascribed to the badness of the seed, which did not germinate at all or failed to germinate freely in most places. The results reported are as follows:—

In the Násik District a small quantity of the seed germinated, but the young plants died soon after being planted out. In the Khándesh District germination was not very regular. A small quantity of the seed was given away and a number of the young trees distributed for planting in the district, and it is reported that eight of the young trees planted on the Model Farm at Bhadgaon are making fair

progress. In the Sátára District the seed did not germinate. In the Ahmednagar District germination also failed except in the Fariabág and Shevgaon Nurseries where twenty plants ranging from three to eighteen inches in height were raised. In the Poona District experiments were made by Mr. Shearer, Agricultural Instructor, Poona, and Mr. Woodrow, Superintendent, Botanical Gardens, Ganesh Khind. Of the seeds sown by the former only three germinated, but the plants withered and died. Mr. Woodrow reports as follows:—

“ This tree with garden treatment has proved of rapid growth, but at a height of ten to twelve feet from the ground the stem divides into a great number of branches, a habit which will greatly reduce its value as a timber tree. With ordinary forest treatment on a thin black soil, which grows ‘ kinye’ (*albizzia procera*) and sissoo (*dalbergia sissoo*) well, the two-year old trees are only four feet high and appear very weakly. As far as can yet be seen the tree is not well suited for the Poona District, and, there are many other sorts which will occupy the land to greater profit.”

10. The Commissioner, C. D., personally planted some of the seeds and looked after them himself, and they germinated freely. Three trees which were planted in light deep made garden soil have sprung up some twenty-five feet, the rest were planted as road-side trees in his compound and have all miserably failed. The Commissioner states that the tree is a wretched straggling tree and apparently of little or no value as timber. It must, however, be remembered that its cultivation was recommended by the Secretary of State not on account of its value for timber but simply for park and avenue planting, and for its fruit which is used as fodder. The Conservator of Forests, N. D., states that the pods of the tree would be useful for fodder, but in no district have the trees yet reached the fruit-producing stage.

REPORT OF PROGRESS IN EXPERIMENTS ON SCALE-INSECTS, WITH OTHER PRACTICAL SUGGESTIONS.

By H. G. HUBBARD, *Special Agent of the Division.*

From Report of Department of Agriculture, Washington, for 1883.

SOAP EMULSIONS.

FURTHER experiments with kerosene emulsions prove that various soaps can be readily made to combine with the oil, and that the soap and kerosene emulsions are as effective as those

formed with milk. The use of soap materially reduces the cost, except where milk is abundant and cheap, as is very seldom the case in Florida.

Common bar soap, soft soap, and whale-oil soap have been tried whale-oil soap when of good quality, may be preferred, as it is stronger, and adds to the insecticidal properties of the emulsion.

The following formula is one which has proved in practice useful where a moderate quantity of emulsion is required. It gives a wash of sufficient strength to kill the eggs of the scale-insects commonly found in Florida:—

KEROSENE AND SOAP EMULSIONS.

Formula.

Kerosene	...	...	2 gallons	=67 per cent.
Common Soap or Whale oil soap		$\frac{1}{2}$ pound		
Water	...	...	1 gallon	=33 per cent.

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force-pump and spray-nozzle for five or ten minutes. The emulsion, if perfect, forms a cream, which thickens on cooling, and should adhere without oiliness to the surface of glass.

Dilute, before using, one part of the emulsion with nine parts of cold water. The above formula gives three gallons of emulsion and makes, when diluted, 30 gallons of wash.

The percentage of oil can be increased considerably without danger to the plant, and a stronger emulsion may, in fact, be required in coping with some of the *Aspidiotus* scales, upon which we have had no opportunity to experiment. But the amount of kerosene in the emulsion cannot be greatly reduced without weakening too much its power as an insecticide.

The amount of soap may also be varied, but less than one quarter of a pound to the gallon of water forms an unstable emulsion.

After another year of experiment and practical experience in the use of kerosene emulsions as a remedy for scale-insects, we see no reason to change the opinions expressed in former reports.

The distrust of kerosene naturally felt at the outset has in time given place to confidence, and the emulsions are now widely used by orange growers in Eastern Florida. Many groves treated with kerosene emulsions have been under our own observation, and the results have been uniformly beneficial. Want of thoroughness in applying the wash, however, frequently renders repeated applications necessary.

The invention and introduction of the cyclone nozzle by the Department of Agriculture, greatly diminishes the labour of applying the liquid to orange trees and insures success with

ordinary care and attention, at the same time reducing to a minimum the amount of liquid required and the expense of an application.

No case of loss or permanent injury resulting from the use of kerosene emulsions has come to our knowledge, although the reckless use of emulsions imperfectly formed, or of unnecessary strength, may be expected to cause defoliation and temporary shock of greater or less severity.

There seems no longer any reason to doubt that in kerosene properly emulsified and diluted we have a nearly perfect remedy, more effective than any other insecticide in destroying scale-insects, and having as slight an effect upon the plant as can probably be expected from any remedy with sufficient penetrating power to reach and kill the eggs of these insects.

In regard to the physiological action of kerosene upon the orange, careful observations have been made during the year. They confirm the opinions hitherto expressed:—

1st.—That kerosene differs from most other remedial agents in being entirely harmless to tender young growth, blossom buds, and young fruit. It may therefore be applied to bearing trees at seasons when other insecticides would cause more or less loss of growth or of fruit.

2nd.—That the shock produced by an overdose is felt more severely upon devitalized portions of the plant, and is not appreciable where there is full vigor.

This shock is quickly followed by a healthful re-action, and is not ordinarily attended with any serious consequences, such as hardening of the bark, &c.

3rd.—That extremes of heat and cold increase, sometimes to an injurious extent, its action upon the plant. Applications made in the hot sun, during the middle of the day, are observed to cause a greater amount of defoliation than would result from the same application made at evening or in the shade.

In winter, when the air is charged with moisture and the nights are cold, with frost or heavy dews, the oil does not evaporate as rapidly as in warm or dry weather. Applications made under such atmospheric conditions sometimes prove unexpectedly severe, and cause the tree to shed all its leaves or even kill a portion of its branches.

The most favorable season for applying kerosene washes is undoubtedly early spring or as soon as all danger of frost is past. Shedding of the last year's leaves, which takes place naturally after the orange tree has renewed its foliage in spring, is often accelerated by the action of the oil, which is thus made to appear very severe. But loss of old and devitalized leaves is of slight consequence, and in the case of badly infested trees is a positive advantage, as the leaves in falling carry with them the scales most difficult to reach with insecticides.

Application of liquid insecticides; fineness and force of spray.— In dealing with an enemy so thoroughly protected as are many of the bark-lice, liquid insecticides should be applied in as fine a spray as possible or at least in moderately fine spray, driven with considerable force, in order to increase to the utmost their penetrating power. The aim should also be to reach and thoroughly wet every portion of an infested tree, so that no individual scale-insect shall escape the action of the liquid. This result is not attainable by the old method of sending a jet from a distance into the tops of the trees. An ordinary garden syringe is practically useless. This nozzle should be attached to a sufficient length of flexible hose to allow it to be introduced into the top of the tree. The orifice of the nozzle should be directed at a right angle to the hose, and not in line with it. The jet of spray may thus by a turn of the wrist be directed upward or downward, and brought into contact with all parts of the foliage and branches, from beneath as well as from the upper side.

The Cyclone nozzle.— A nozzle which answers the above conditions and is easily attached to any force-pump by means of a rubber tube is described in the report of the Entomologist, (Department of Agriculture, 1881-82, page 162.) It consists of a shallow, circular, metal chamber soldered to a short piece of metal tubing as an inlet. The inlet passage penetrates the wall of the chamber tangentially, admitting the fluid eccentrically, and causing it to rotate rapidly in the chamber. The outlet consists of a very small hole drilled in the exact centre of one face of the chamber. The orifice should not be larger than will admit the shaft of an ordinary pin. Through this outlet the fluid is driven perpendicularly to the plane of rotation in the chamber. Its whirling motion disperses it broadly from the orifice, and produces a very fine spray, which may be converted into a cloud of mist by increasing the pressure in the pump. The perforated face of the nozzle chamber is removable for convenience in clearing the orifice when it clogs. The diameter of the chamber inside need not exceed one-half inch, and its depth one-quarter inch. A nozzle of these dimensions attached to the Aquapult pump covers one and a half square yards of surface at a distance of four or five feet from the orifice. The amount of dispersion depends somewhat upon the thickness of the perforated face of chamber. The diameter of the cone of spray may be increased by countersinking the exit hole and making its edges thin.

Half-inch gum tubing is sufficiently large to supply one or a gang of several nozzles. The tubing must be strengthened with one ply of cloth.

In use, the end of the hose is supported by being fastened to a light rod of wood, which forms a handle, by means of

which the nozzle may be applied to all parts of the tree. For full-sized trees a rod long enough to reach nearly to their tops must be used. For this purpose a convenient device may be made by passing the small rubber hose through a hollow bamboo rod of the required length. A three-sixteenth brass tube inserted in bamboo rod has also been used.

Cost of kerosene wash.—The following is the estimated cost for a standard wash of whale-oil soap and kerosene emulsion containing 67 per cent. of oil, and diluted 1 to 9:—

Kerosene, 2 gallons, retail at 20 cents.	...	...	0	40
Soap, $\frac{1}{2}$ lb. retail at 10 cents.	...	...	0	5
Water, 1 gallon	...	...	...	<hr/>
3 gallons Emulsion	...	...	0	45

At wholesale rates, 18 cents. for kerosene and 8 cents. for soap, three gallons of emulsion costs 40 cents.= $13\frac{1}{3}$ cents. per gallon. One gallon of emulsion=10 gallons of diluted wash; cost 15 cents. cost of wash per gallon $1\frac{1}{2}$ cents.

With the "Aquapult" pump and "Cyclone" nozzle, four gallons of wash is sufficient for thirty nursery trees of one and two years from the bud. Cost per tree, two-tenths cent.

Trees which have been transplanted and have made two year's average growth in the grove (three or four years from the bud) require about two-thirds of gallon of wash. Cost, one cent. per tree. Bearing trees of full size will require from five to ten gallons of wash. Cost, seven to fifteen cents.; average about ten cents. per tree.

Monthly Proceedings of the Society.

Thursday, the 13th January, 1881.

W. H. COGSWELL, Esq., Vice-President, in the Chair.

The proceedings of the last meeting were read and confirmed.

The election of Officers and Council was next entered on with the following result :—

President.—Mr. W. H. Cogswell.

Vice-Presidents.—Baboo Peary Chand Mittra, Mr. S. H. Robinson, Mr. G. L. Kemp, and Baboo Joykissen Mookerjee.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. J. E. MacLachlan, Mr. R. Blechynden, Dr. G. King, Mr. H. J. Leitch, Dr. S. Lynch, Baboo Protapa Chundra Ghosa, Mr. W. Stalkartt, Rajah Suttyanund Ghosal, Bahadoor, Mr. J. G. Meugens, Mr. A. Wilson, Mr. W. Pigott, and Mr. H. A. Firth.

The names of Mr. Cogswell, and Baboo Bholanath Dhur, were added to the Sugar Committee and Mr. J. G. Meugens to the Tea Committee.

The names of the following gentlemen were submitted for Membership :—

C. Duke, Esq., Assistant Commissioner, Engstein, Rangoon,—proposed by the Secretary, seconded by Baboo P. C. Ghosa.

Bhupendra Bahadoor Sing, Rajah of Kuntil,—proposed by Mr. W. G. Jackson, c. s., seconded by the Secretary.

W. Martin, Esq., Indigo Planter, Mynpoory,—proposed by Mr. J. Thomas, seconded by Mr. R. Blechynden.

T. J. Kallonas, Esq., Indigo Planter, Mymensing,—proposed by the Secretary, seconded by Mr. J. E. MacLachlan.

Rejoined.—T. Allen Brown, Esq., Deputy Magistrate, Agra.

The following gentleman was proposed, on the recommendation of the Council, as an Honorary Member :—

T. Lewis Bernays, Esq., Vice-President, Queensland Acclimatization Society.

Thursday, the 17th February, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The proceedings of the annual meeting were read and confirmed.

The following gentlemen were elected Ordinary Members :—

Messrs. C. Duke, W. Martin, T. J. Kallonas and Bhupendra Bahadoor Sing, Rajah of Kuntil.

Honorary Member.—Mr. T. Lewis Bernays, V. P., of the Queensland Acclimatization Society.

Proceedings of the Society.

The names of the following gentlemen were submitted as desirous of joining the Society:—

Major the Hon'ble E. Baring, R. A., C. S. I.—proposed by the President, seconded by Mr. G. L. Kemp.

H. H. Shiwaia Rao Holkar, first Prince of Indore,—proposed by the President, seconded by Rajah S. A. Ghosal, Bahadoor.

C. E. Fendall, Esq., Forest Department, Phillour,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Baboo Lalit Mohun Raya, Zemindar of Chakdigrah,—proposed by Mr. F. Wyer, c. s., seconded by Baboo P. C. Mittra.

Edward Poppé, Esq., Calcutta,—proposed by Mr. W. H. Cogswell, seconded by Mr. J. W. O'Keefe.

R. Williamson, Esq., Messrs. Finlay Muir & Co.,—proposed by Mr. Cogswell, seconded by Mr. W. H. Pigott.

Baboo Hem Chunder Gossain, Serampore,—proposed by Baboo Joykissen Mookerjee, seconded by Baboo P. C. Mittra.

The General Manager, Indian Glenrock Gold Mining Company, Devala,—proposed by Mr. S. Jennings, seconded by the Secretary.

Rejoined—Thos. Hindmarsh, Esq., Kanchraparra, F. Schiller, Esq., Calcutta, and the Hon'ble Mr. Justice Cunningham.

CONTRIBUTIONS.

1. Report on the Administration of Bengal, 1879-80, and on the Internal Trade of Bengal for 1879-80. From the Government of Bengal.
2. •Report of a tour in Cuddapa and North Arcot Districts; by the Superintendent Government Farms, Madras. From the Government of India.
3. Memoirs of the Geological Survey of India. Vol. 18, Part 4, Vol. 15, Part 3 and Palæontology Indica, Ser. XII., Vol. III. From the Director.
4. Twelve copies of Mr. W. Haworth's report on the cultivation and manufacture of Tea in Cachar. From W. H. Cogswell, Esq.
5. Catalogue of articles sent to the Melbourne Exhibition of 1881, from the N. W. P. and Oude. From the Director Department of Agriculture.
6. Report of Committee of Bengal Chamber of Commerce. From the Chamber.
7. The Indian Forester, January, 1881. From the Editor.
8. Journal Asiatic Society of Bengal. Part 2, No. 3, 1880, and Proceedings for November, 1880. From the Society.
9. Seeds of Cypress and Cryptomeria. From the Superintendent Botanic Garden, Saharunpore.
10. A small assortment of seeds from the Botanic Garden at Trinidad. From the Director.
11. A healthy plant of *Cyclamen Persicum*. From T. M. Francis, Esq.
12. A plant of *Magnolia grandiflora*. From C. Nickels, Esq.

18. Seed of *Cassia magnifolia* and of a good species of *Musa*. From L. A. Bernays, Esq.

ANNUAL FLOWERS SHOW.

The report of the Judges (Dr. G. King, Messrs. G. L. Kemp, W. Pigott and Baboo P. C. Ghosa) on the Show of Flowers held in the Society's Garden, on the 3rd February, was submitted as follows:—

The collection of plants exceeded that at last year's Show, but the competition was scarcely greater, being confined to about 20 gardens. The assortment of Roses in pots was limited, but the cut specimens were fully equal to those of last year, some of them being exceedingly good. There was an excellent display of handsome foliage plants, including Begonias, Dracænas, Marantas, Crotons, &c. There was a large collection of annuals, of which Asters were exceedingly well represented. The Geraniums, in flower, from Belvedere, consisted of several well grown plants, and the collection of Camellias was more numerous than heretofore.

The Royal Botanical Garden contributed an interesting collection for exhibition only, not for competition. Among these were collections of Orchids, Crotons and Dracænas, the latter two to three feet high, new Coleus of kinds, a very fine specimen of Acotrema species, fine large plants of Areca crinata, Panax tricochleatum, Acalypha illustrata and Aspidium aristatum variegatum (new plants) fine specimens of Alocasia Lowii and other Alocasias, and a collection of Cacti.

The Belvedere Garden collections were again the largest, and obtained the greatest amount of prizes. Among them were the Geraniums already referred to and Fuchsias.

The Eden Gardens shewed well in annuals, specially Verbenas, Asters, Phloxes and Portulneas.

Mr. F. Lazarus and Mr. Wormack submitted stands of excellent Crotons, so equally good that the prizes for first and second best collections were divided equally between them. Mr. R. B. West gained the prize for the best collection of Crotons of recent introduction, as also for Dracænas, and Baboo S. P. Chatterjee for the general best collection. To the same Garden was awarded the prize for the best collection of new and rare plants, and Mr. S. Apcar received the prize for the second best.

Extra prizes were awarded to Mr. G. Roberts for a good collection of Orchids, and to Mr. J. Lynan for an exceedingly fine example of Phalaenopsis Schilleriana; to Mr. West for a good specimen of a new plant (*Anthurium Warnequena*); to Mr. Apcar for an excellent tree fern, and for a specimen, in flower, of a Japanese Peach; to Mr. F. A. Lazarus for a good collection of Ferns in a glazed stand; and to Mr. E. Mettiss for a collection of standard Roses in fine condition.

Proceedings of the Society.

A small collection of plants from the Society's Garden was introduced for exhibition, including *Ficus Parcelli*, *Gardenia Stanleyana*, *Cyanophyllum magnificum*, *Aphelandra nitens*, *Araucarias*, &c.

Mr. W. Stalkart sent for exhibition some fine Araucarias of sorts, *Cookei*, *rulei*, *excelsa*, *Bidwillii* and *Cunninghamii*.

The attendance of visitors, including Members, was numerous, probably one thousand. The Show was opened at three and closed at dusk.

The sum of Rs. 302 was awarded for prizes of which a detailed list is annexed.

His Excellency the Viceroy and the Marchioness of Ripon and His Honor the Lieutenant-Governor honored the Show with their presence.

Though the collections were better arranged than last year, there was yet room for improvement. To provide for this, the Judges would propose that each exhibitor be called on to submit lists of the plants he intends submitting 10 days at least before the day of Show, and the quantity of space to be reserved for him. Had this information been given on the present occasion four extra tents would have been provided and a larger number of tables for the accommodation of the numerous plants submitted. For want of the necessary space several collections, notably Crotons, were too much crowded together and consequently not properly exhibited; causing also extra trouble to the Judges. We would further suggest that all plants intended for competition be sent in by noon the day previous to the date fixed for the exhibition.

There are a few other minor suggestions which are appended herewith, some of which should be introduced into the conditions of next exhibition and the others recorded for future guidance.

The Council reported that the usual annual show of vegetables and fruits could not be held last month in consequence of the lower basement of the Town Hall being occupied, and there being no other 'covered space' of sufficient size, in a centrical position, suitable for the purpose.

POTATOES FROM MELBOURNE.

The Secretary mentioned that having obtained a small consignment of potatoes from Melbourne (32 Maunds) in tolerably good condition for planting out, he had lost no time in transferring the whole, at prime cost, to Messrs. Lloyd & Co., who had immediately despatched them to their Tea Gardens at Darjeeling, and promised to communicate the result in due course.

MANILLA HEMP.

Submitted the following circular from Surgeon-General Edward Balfour on the subject of the Manilla Hemp plant:—

Mr. Liotard, of the Agricultural Department of the Government of India, has this year (1880) reported on the materials in India, suitable for the man-

facture of paper. Several of the fibre-yielding plants are mentioned by him and, amongst others, various species of the genus *Musa*, of the plantain or banana tribe, many of which have been grown in the East Indies from the most remote times. At pages 54 to 58 he describes the introduction, in February, 1858, of the Manilla hemp plant, direct from the Philippines into the Madras districts, by Colonel (now Sir George) Balfour. Nevertheless, the Import Trade Returns of the United Kingdom show a large and continually increasing delivery of hemp from the Philippine Islands, now averaging yearly about 20,000 tons, valued about half a million sterling. I have

Year. Cwt. £ ascertained from the London Produce Brokers, through Dr. Birdwood, of the India Office, that this important article is the true Manilla hemp from the *Musa textilis*, that the bulk of it is delivered

in London, where it is made up into cordage and ropes for ships, especially for yachts' running rigging, being very light, strong, and clean, and also for clothes lines. But there is no doubt that the Manilla hemp plant, *Musa textilis*, grows as well in British India as other species of the plantain or banana genus, and that British India could, in a couple of years, supply the London market with all that it could take of Manilla-hemp fibre. The prospect of benefiting British India by creating an export trade from it of the extent

1861, 24th April,	No. 2128
" 31st May,	2755
" 1st June,	2817
" 21st "	8226
" 25th "	3301
" 6th August,	4212
" 5th "	4219
1862, 13th February,	894
" 16th "	983
" 24th Sept.",	6096

and value above indicated might well incite to considerable efforts to attain success. In 1861 to 1863 the Madras Revenue Board made continuous efforts* to secure the naturalisation of the plants which Colonel Balfour had introduced; but their efforts seem to have been effectual only in the Wynnaad, from which, by 1877, the Conservator of

Forests replied that the Philippine variety had been introduced on several of the coffee estates, where it grows remarkably well, and no doubt is felt there as to the value of its fibre. The attention of the Boards and Commissioners of Revenue, and of the Agri-Horticultural Societies might be re-directed to this plant.

The Secretary stated that *Musa textilis* was grown for several years in the old garden of the Society, but it did not progress satisfactorily, and the cultivation was eventually abandoned.

MUNJEET.

Read a letter from Messrs. J. Perrin, of Berhampore seeking information regarding the article Munjeet. "Can any one of the Society"—writes Mr. Perrin—give me some information regarding a plant called Munjeet (vern. Munjista)? It is much used by native dyers as a substitute for madder, and like the latter gives fast colours. It is usually imported from Assam or Bhootan, I am told, but so irregularly that at time (it is the case now) it is impossible to

procure in Calcutta or elsewhere. Perhaps you or some Members of the Society might know whether the plant could be cultivated in Lower Bengal. If the attention of the Tea Planters of Assam, Darjeeling, or of the Hill Stations was called to the usefulness and mercantile value of the plant, they might introduce it in their garden. I hear it is now exported from Calcutta.

The Secretary submitted a full memorandum on the subject which he had sent to Mr. Perrin, who thankfully acknowledges it, and "the most interesting and useful information it contains. We use here Mungect regularly for silk printing, but as it is imported very irregularly from up-country, we remained months without being able to procure some; hence my wish to enquire whether it could not be introduced in the plains, but I see it is out of the question."

Agreed that this memorandum be published in the Number of the Journal now in the press.

OPIUM CULTIVATION IN THE HIMALAYA.

Submitted the following remarks from Captain J. F. Pogson on this subject:—

British India, with its varied fertile soils and climate, is capable of producing sufficient opium of all kinds to supply Europe, Asia, Africa, Australia, and all America.

The demand for first class opium for medicinal purposes increases daily; and, though the Himalayan cultivators are able to produce it no effort is made to throw this most valuable description of opium into the London market. The bunnearahs have the entire poppy cultivation and opium trade in their hands, and the practical result is their enrichment and the hopeless impoverishment of the cultivators.

I will give an example on the large scale. In the British Himalayan province of Kishneewar, miles and miles of land are annually placed under poppy culture. The very large quantity of first class Opium which results is sent or smuggled into China, *via* Ladak and Thibet; and thus a leak of perhaps not less than fifty lacs of rupees is steadily taking place in neglected and unknown portions of opium-producing British territory.

The Thibet and Hindooostan Road begins at Kalka, and the tracing ends at Shipkee, on the Chinese Frontier. A road, such as it is, connects Kishneewar with the valley of the Sutledge in Kanawur, (upper Busahir,) and so joins the Thibet road line. Now if a regiment of Pioneers were sent to Kishneewar to open out and improve the existing road, and another half regiment of Pioneers were sent to open the road to Shipkee so as to fit it for mule traffic, the opium of Kishneewar, produced under the superintendence of an Opium Agent (B. C. S.) could be sent to Shipkee and a regular frontier trade in opium and merchandise established between British India, *via* Simla and China. Of course every inducement and facility should be offered to Thibetian and Chinese traders to visit Simla; and, as it is perfectly legitimate for the Government of India to convert an illicit intra-Himalayan opium trade with Thibet and China into a legitimate traffic, all parties concerned would be benefited, and the Government especially so.

The *Kiskeewar* poppy cultivation would be taken out of the bunneeah's hands and all the zemiudars released from their thraldom. The production of first class medicinal opium for export to Europe and America would speedily follow; and as such opium should be sold at a Government Opium Mart to be established at Umritsir, the representatives of London firms would purchase, readily and largely, an opium rich in morphia and other valuable medicinal alkaloids extant in superior opium but deficient, or entirely absent, in the opiums of Bengal and Behar.

I maintain that it is quite possible for the Indian Opium Revenue to be increased to twelve millions sterling from its present figure, leaving Malwa Opium duty out of the calculation. But to secure such results action, and not useless and prolonged correspondence, should be the course selected for adoption.

Letters were read—

1. From Major S. S. Jacob, ex-Engineer, Jeypore, enclosing a letter to his address from Dr. Schwenfurth of Cairo, asking for certain seeds, and offering to reciprocate.

The Secretary mentioned he had been able to meet this requisition partially, through the kind assistance of Dr. King.

2. From the Director Department of Agriculture, N. W. P. applying for a certain quantity of American Cotton seed. Application put in hand.

3. From the Manager, Ceylon Company, " Limited," acknowledging receipt, in excellent condition, of a quantity of *Ficus elastica* plants.

4. From Dr. Geo. Henderson, Rawul Pindi, suggests the distribution by the Society of seeds of *Pinus longifolia* throughout India. "The tree thrives well—" remarks Dr. Henderson "in most parts of India, down as far as Purneah, and I think it has succeeded about Calcutta. The only difficulty about raising the trees is that they take about two years to attain a height of one foot, and if the top is injured their growth is greatly retarded. There is no tree in India more worthy of cultivation, whether for shade, ornament, fuel or timber and it thrives from Peshawur and Calcutta. I would suggest that you call the attention of Railway officials to it; they might grow it all along their lines and at Railway Stations." (Application for seeds made to Superintendent Botanical Garden, Saharunpore.)

5. From the Conservator of Forests, Central Provinces, applying for a small quantity of Indigo seed. (In course of compliance through the kind assistance of Messrs. W. Moran & Co.)

6. From the Director Department of Agriculture, North-Western Provinces, applying for information in respect to judging the merits of ploughs and their working, in anticipation of experimental ploughings which are about to be made in certain stations. (Complied with through the kind assistance of Dr. Lynch.)

7. From Captain J. F. Pogson, returning thanks for his election as an Honorary Member.

8. From L. A. Bernays, Esq., notifying his resignation of the office of V. P. of the Queensland Acclimatization Society, and expressing his willingness notwithstanding, to continue to render any aid in his power to the Society. Mr. Bernays has been most kind for some years past as his contributions to the garden will shew, and his offers are thankfully accepted.

9. From Captain Pogson, respecting the introduction of certain food grains and economic plants into the Himalayas. (Transferred for Journal now in the press.)

10. From the Secretary British India Association acknowledging receipt of one hundred copies of extract from the Society's Annual Report and promising to distribute them.

11. From Messrs. Sutton & Sons, Reading, in reply to complaint of the non-germination of many of the flower-seeds supplied last year. The following is extract of their letter :—

" We exceedingly regret to hear that you have unsatisfactory reports about some of the Flower seeds.

We are quite at a loss to account for it, and should be greatly obliged to you if you could give us every possible information on the subject.

We have kept particulars of every sort of seed sent, and can trace each one to the grower.

We never took more pains than we did last year in the execution of the order. In fact, as our foreign trade is rapidly increasing we are extending our facilities, and have a special staff now always engaged in the work. Every lot of seed sent you was proved to germinate well just before it was packed, and that it should have gone off growth so soon afterwards is inexplicable to us.

We can only suppose that the disastrous harvest of 1879 has something to do with it; and that although the seeds grew well enough for the first six months after they were gathered, yet that we had not sufficient sun to thoroughly mature them, and enable them to retain their growth until they were sown in India full 12 months afterwards.

Any way, we can assure you that we esteem it such an honor to supply your Society, that it is with the greatest possible regret we learn, that we have not been so successful this season as in previous years."

For the above communications and contributions, the best thanks of the Society were accorded.

Thursday, the 17th March, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected Members :—

Major the Hon'ble E. Baring, H. H. Shewaja Rao Holkar, Messrs. C. E. Fendall, Edward Poppé, R. Williamson, Buboos Lalit Mohun Raya, Hem-

chunder Gossain, and the General Manager Indian Glenrock Gold Mining Company.

The names of the following gentlemen were submitted as desirous of joining the Society :—

The Manager Rajmai Tea Estate, Assam,—proposed by the Secretary, seconded by Mr. J. E. MacLachlan.

Col. A. W. Twiss, n. a., Commanding R. A., Morar,—proposed by Lt.-Col. E. L. Hawkins, seconded by the Secretary.

O. G. R. McWilliam, Esq., c. s., Deputy Commissioner, Luckimpore, Assam,—proposed by Mr. F. St. C. Grimwood, o. s., seconded by the Secretary.

E. A. Roussac, Esq., Deputy Post Master General, Dinapore,—proposed by Mr. T. M. Francis, seconded by Mr. R. Blechynden.

CONTRIBUTIONS.

1. Wardle on the Wild Silks of India. From Government of India.
2. Proceedings of the Agricultural and Horticultural Society of Madras from May 1880 to February 1881. From the Society.
3. Report on the progress and condition of the Government Botanical Gardens at Saharunpore and Mussoorie, for the year ending 30th June, 1879.
4. Transactions of the Asiatic Society of Japan, Vol. 8, Part 4. From the Society.
5. Journal of the Asiatic Society of Bengal, Part 1, No. 4, and Part 2, No. 4 for 1880, and Proceedings for December 1880, and January 1881. From the Society.

PATRON OF THE SOCIETY.

Read the following letter from the Private Secretary to His Excellency the Viceroy, dated 24th February :—

"I have submitted to the Viceroy the Resolution passed at the monthly meeting held on the 17th of the Council of the Agricultural and Horticultural Society of India, soliciting His Excellency to allow himself to be named Patron of the Society; and he desires me to request you to inform the Council that it will give him great pleasure to comply with this request.

I am to add that His Excellency will have much pleasure also in subscribing Rs. 250 annually towards the funds of the Society, and I accordingly enclose that sum on account of the subscription for this year."

Resolved—That the best acknowledgments of the Society be tendered to His Excellency for his kind compliance with the Council's request, and for his handsome subscription to the funds of the Society.

GARDEN.

A report from the Superintendent of the Garden was submitted, of which the following are extracts :—

1. The garden labour has been kept well employed in clearing up the garden, removing aloes and other plants that had got too thick for ornamental and

other purposes—transplanting, manuring, cleaning up the drains, and other general routine work.

2. Rose plants from Mr. Bull received on 7th December 1880. Of these the final loss has not exceeded 5 per cent. 136 have been planted out in an open spot, adjacent to, and south of west tank: another plot to north of same tank is being prepared for the remainder.

3. Rose plants received from Mr. Bull on 1st March current. These have not unfortunately reached in such good condition, as the lot received of 7th December 1880—fully half of them being dead or unlikely to recover.

4. Several new varieties of Crotons, Begonias, and Coleus have been added to the garden and propagated from.

5. 40 Rose plants have been received from the Kooshroo Bag, Allahabad, 20 of Rein des Violets, and 20 Princess Adelaide; these have been planted out to east of, and adjacent to, west tank.

6. *Pears*.—The following varieties were sown in the latter part of November:—Woodford Marrow Rising Sun, Maclean's Little Gem, Yorkshire Hero and Blue Prussian, in a biggah of land, the plot where it is purposed to carry out manure experiments for the Bengal Government; the seed is now being gathered, and a fuller report will be submitted hereafter. The germination was very good, and a fair outturn is anticipated.

7. *Annuals*.—The result of sowings have been successful, and they are now making a good show, in beds prepared on the large grass plot. Notably Antirhinums, Phlox, Petunia, Portulaca, and Verbena; these will probably continue in flower for another month, and will yield a plentiful supply of seed in due course.

8. *Water*.—In consequence of the unusually dry season we have experienced, not even one shower of rain for upwards of four months, there has been a great demand on our labour force for artificial watering. The tanks are, however, tolerably well supplied with water, especially that to the west, and we may hope to tide over our annual difficulty in this respect.

9. *Propagation*.—The stock of fruit grafts, Roses, and other ornamental plants that were propagated during the rainy season, is tolerably large. We have succeeded in disposing of a good number of Roses, but still the supply is not equal to the demand. A large number of Rose cuttings were put down in January. A great many have struck root, and if they survive through the season, the garden will have a fair quantity for issue to Members.

10. The garden has a large quantity of Red Pumelow, Avocado Pear (*Persea gratissima*), and Citron plants ready for issue. Also Liberian and Arabian Coffee seedlings.

11. Caladiums are being potted off.

12. Seeds of trees and shrubs are being now gathered, which will be useful to meet applications from Members.

13. *Manure*.—A large quantity has been received from Mr. H. A. Firth, of Garden Reach, and others, at no cost to the garden. The garden carts being employed in conveying the same.

14. There has been full occupation for the two garden carts, delivering plants purchased by Members, carting manure, &c.

15. A specially fine lot of *Araucarias* of different varieties are now at the garden for sale, some being well grown and of fair size.

5th March, 1881.

Supplementary Report.—At 6-45 p. m. on the 5th Instant (just after my first report had been sent in) there was rather a heavy fall of rain accompanied by hailstones of considerable size. The damage to the glass houses, propagating, and lean to, was 284 panes of glass broken. The Mangoe and other fruit trees have been entirely stripped of this season's crop, which, before the storm, promised to be abundant. Some Araucarias have been slightly damaged, also several other plants of no special value. The rose cuttings mentioned in report of 5th instant have suffered likewise, and I very much fear $\frac{1}{3}$ ths at least will be lost.

Out of the lot of Rose plants received from Mr. Bull on the 1st Instant, 50 arrived dead, 55 very poor and unlikely to recover, 97 promise well.

The acclimatized peas have been gathered, the quantity being 44 and a half scrs. The outturn would have been better, but the hail and storm of the 5th destroyed fully three times the quantity collected.

The annuals have also suffered very much, and the quantity of acclimatized seed that will be gathered will not be as large as anticipated.

The Garden has, on the other hand, benefited by the rainfall, the draw off from the tanks of water for some eight days being almost entirely suspended, and the garden labor being deviated to other pressing work: one of the bamboo sheds for plants being entirely repaired and renovated during this period.

The Pineapple bed has got very thick, transplanting will be taken in hand as opportunity offers.

Special arrangements have been made for the different kinds of manure, for farming experiments.

A large quantity of *Poinciana regia* seedlings ready for issue.

16th March, 1881.

The Secretary called attention to the large collection of cutflowers on the table, consisting principally of Verbenas, Petunias, Phlox, Asters, Pinks, Antirrhinums, Browallias and Heartsease which have made a good show in the garden during the last two months, but have suffered considerably from the recent severe hailstorm. The Verbenas, Petunias and Snapdragons have been especially good.

REPORT ON FIBRE OF THE "BURRIARA." (SIDA RHOMBOIDEA.)

Read a letter from the Secretary to the Government of Bengal, forwarding some specimens of Burriara fibre received from the Raja of Balihar, in the

District of Rajshaye, for the favor of a report "on the quality of the fibre and its commercial value and suitability for the Indian and home markets."

Read also the following reports thereon by a section of the Fibre Committee :—

Mr. W. H. Cogswell.—I have been called upon on several occasions, and through various channels, to express opinions on samples of similar fibres submitted to me, and as these alluded to by the Government of Bengal in their letter No. 4th For: now under consideration, are identically the same, viz., the "Sida rhomboidea," I think I cannot do better than preface my present remarks with the following report which I made to the Secretary of the Economic Museum in January of last year :—

"Replying to your No. 2901 of the 13th Instant, I beg to say that I have carefully examined the sample of fibre prepared from the Sida rhomboidea, and which I return herewith. I am of opinion that none of the samples have been steeped a sufficient time; those subjected to 2, 3, and 4 days' submersion, particularly the former ones, are very imperfectly done, and the best sample subjected to 5 days' treatment, proves insufficient. There is much hard, harsh, boky, gummy substance adhering to the fibre which would have been removed under a more lengthy process. There is also much of what I term croppy ends about some of it, which would not be apparent if the plant had been better matured before it had been cut. I would suggest that some of the longest stems of the plant should be taken, prepared in the usual way, and steeped for 7 to 10 days, about the same time as jute is steeped, care being taken that the steeping or retting process be not carried beyond the above period, as the fibre may become very weak, and towy in consequence. A large sample should be prepared, and I will get it tested in one of the Jute Mills, to see what percentage of warp yarn can be spun from it, and a correct value shall be arrived at. There is much in these samples of a soft, bright, glossy, clean fibre, but it is very short in comparison with Jute, barely half its length, the value being very materially reduced in consequence."

These samples now under review are from Rajshaye, the same district as those alluded to in my foregoing report, I imagine, and probably from the same source; for whilst in those of the former, I pointed to deficiency of steeping, I have now to remark that some portions of these new samples have been kept too long in the retting process, the result being that some of the fibre has suffered in strength, and is somewhat towy, or to use a Scotch expression, most pregnant with meaning, it is "fozie," i. e. the fibre is wanting in body, in substance, weight for weight, with that of a similar quantity of Jute. To a few, even experienced men, this fibre might be mistaken for that of fine Jute, though not one-fourth of its average length, when deprived of the root ends, as this has been. Its colour is glossy bright in the extreme, and of a very high order. The fibre is strong, fine, round, and of excellent spinning properties, and is well suited for the finest yarns of Jute manufacturers; some of it is so

silky, as to render it in my opinion fit for higher purposes. I value it at about Rs. 4-8 @ 4-12 per bazaar maund. I think the flax manufacturers at home would be ready consumers of it. The fibre is somewhat more irregular in staple than that of fine Jute, due in some measure if not entirely so, I think, to its treatment in the duration of steeping, drying, and handling afterwards.

I believe this order of plant, the Malvaceæ, is to be found growing wild. Its cultivation, and after treatment, and preparation of the fibre is exactly like that for Jute, and I think it is to be regretted that no data have been furnished as to the cost of its production, and the yield per beegah. It would be necessary to have this, to arrive at its correct commercial value in comparison with that of Jute, when a full opinion is required as to its spinning capabilities, &c., and a reliable commercial value has to be arrived at, it is necessary that very large samples should be submitted for experiment, if proper justice is to be done. Of its suitability for the Indian and Home markets, there can be no two opinions, and the following remarks fully endorse my own views. I am indebted to the courtesy and kindness of Mr. Alexander of Messrs. Macneill and Co.'s "Ganges" Jute Mill to whom² I gave the samples, to be passed through his preparing and spinning machinery, and the following is the result with the specimens I now submit:—

"I send per bearer the samples of 7½ lbs. yarn one warp, and the other weft, "made from the sample of fibre you handed to me last week. There is also a "sample of silver from the drawing, and to allow of better comparison I send "you a sample of our Hessian Silver taken off the same drawing. The sample "we had was so very small, only 3½ scers, that it was with the greatest difficulty "we got it made into yarn, which accounts for it being so unlevel. We could, "however, judge that there would be no more difficulty in working it than the "usual country Jute. There is more gum in the sample than is usually found "in the common Jute. It is not quite so strong apparently, having been over- "steeped in preparing, and the fibre rather coarser. There is no reason why "it ought not to be largely used."

I forward the three samples in question.

Mr. W. Stalkartt.—Mr. Cogswell has given such a very full report on these samples of Sida fibre that I have nothing more to add. The question is, can it be produced as cheap, or nearly as cheap, as Jute.

Resolved—That the specimens of the yarns above alluded to be forwarded to the Government of Bengal with copy of the reports.

In connection with the above the Secretary called attention to a report in 1851 on this Sida fibre which was submitted by the then Fibre Committee. The specimen was sent by Col. Hannay, from Assam, and most favorably reported on. Subsequently, a further and favorable report was given on specimens raised in the Society's Garden. These were forwarded to the Chamber of Commerce at Dundee, who intimated that the quantity was too small to admit of a definite opinion being given. (*See Journal of the Society, Vols.*

8 and 9, old series.) Since that time this fibre has been occasionally brought to the notice of the Society.

COTTON FROM THE CAWNPORE EXPERIMENTAL FARM.

Submitted a letter from the Assistant Director, Department of Agriculture, North-Western Provinces, forwarding certain specimens of cotton raised on the Experimental Farm at Cawnpore, and requesting an opinion thereon.

Submitted also the following report by a Section of the Cotton Committee (Messrs. Cogswell and Mosley) on these specimens:—

<i>Mr. Cogswell</i> —No. 1. (Kulpahar)—Color good; staple short but strong, containing a little seed, and some leaf and stain, would class with “good” Bengal, worth	5½d. per lb.
No. 2. (Bamia)—Color brown; staple long, strong and fine; free from seed, but containing a little leaf, and much stained and perished staple; would class with “good fair” brown Egyptian, worth	7½d. "
No. 3. (New Orleans)—Color fair; staple short but strong; containing a little seed, leaf and stain; would class with “middling” Orleans, worth	6½d. "
No. 4. (Tree)—Color good; staple irregular; free from seed and leaf, but containing a little stain; would class with “good middling” white Egyptian, worth	6½d. "
No. 5. (Upland Georgia)—Color good; staple fairly long but irregular; containing a little seed and leaf, and some stain; would class with “good middling” Uplands, worth	6½d. "
No. 6. (Farm Bamia)—Color very good; staple poor, being short and weak; containing much seed, and some leaf and stain; might pass as “middling” white Egyptian, worth ...	5½d. "

Mr. Mosley—Replying to your circular letter of 2nd Instant I now return the six samples of *cotton* said to have been grown on the Experimental Farm at Cawnpore, and which I find to be very fully described in the Report by Messrs. W. Haworth & Co., the several specimens representing useful qualities for the European ^{and} or China markets. Their indifferent condition is evidently the result of a want of proper care in the gathering of the bolls and subsequent separation of the fibre from the seeds, and it would have been interesting to know some particulars of the nature and extent of cultivation, as also whether the produce was raised from imported or acclimatised seed.

CROCODILE OIL.

Read the following letter from the Secretary of the Eglinton Chemical Company, “Limited,” Glasgow, in continuation of previous correspondence:—

We duly received your favor of 7th December last and printed copy of Transactions of your Society, in which reference is made to Crocodile Oil. We are

very much obliged for the extremely courteous manner in which our communication has been entertained and attended to, and we should feel ourselves still further indebted to you if you could procure and send us a small sample of the oil (any convenient size) and give us some idea of the price at which it could be obtained.

Our attention has been drawn to Crocodile Oil as being likely to be of use in dressing leather which is *tanned* by a new process in which we are interested, and we should like to make trial of it. We are sending you by this post some pamphlets and trade journals containing information as to this new tanning process which dispenses entirely with vegetable substances, and which we venture to hope may be of interest to your Society.

We shall, of course, be ready to pay the whole cost of transmission of the sample of oil.

Agreed—That the Secretary of the Company be requested to communicate direct with the parties mentioned in former letter, the Society having done their part.

Letters were read—

From J. McGibbon, Esq., late Director Botanic Garden, Cape of Good Hope, offering to exchange plants and seeds with the Society. (Agreed to.)

From the Superintendent of the Public Garden, Allahabad, advising despatch of some Rose plants. (Received).

From Mrs. Walker, Purneah, expressing her satisfaction with the flower seeds received last year. Mrs. Walker adds—"I have grown potatoes yearly from the genuine Darjeeling seed, with very great success, both as to size and quality. May I send some specimens this season to the Society when the bulbs have been dug up. I think they will compare favorably with any kind grown in India. (Accepted with thanks.)

Thursday, the 21st April, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last monthly meeting were read and confirmed.

The following gentlemen were elected Members:—

The Manager, Rajmai Tea Estate, Assam; Col. A. W. Twiss, Messrs. O. G. R. McWilliam and E. A. Roussac.

The names of the following gentlemen were submitted as desirous of joining the Society:—

A. H. Collins, Esq., c. s., Assistant Commissioner, Hazareebagh,—proposed by Mr. F. Wilcox, seconded by Mr. H. A. Firth.

T. C. Pandè, Rajah of Pakour,—proposed by the Secretary, seconded by Baboo P. C. Mittra.

W. Innes, Esq., Deputy Traffic Superintendent, E. B. Railway,—proposed by Mr. W. H. Cogswell, seconded by Mr. W. Stalkartt.

Alfred Bridge, Esq., Calcutta,—proposed by Mr. R. M. Daly, seconded by the Secretary.

Lieut.-General Dhoje Nursingha Rana Bahadoor, Nepal,—proposed by the Secretary, seconded by Baboo P. C. Mittra.

J. A. Anderson, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. W. Pigott.

T. S. Anderson, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. Pigott.

The Secretary, Public Garden, Baugulpore,—proposed by the Secretary, seconded by Mr. S. H. Robinson..

H. E. M. James, Esq., Bombay Civil Service,—proposed by Mr. D. R. Lyall, seconded by Mr. A. Wilson.

James Paterson, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. Stalkartt.

T. H. Kerswill, Esq., Khoreel Tea Garden, Cachar,—proposed by Mr. W. Aitchison, seconded by the Secretary.

• *Rejoined*—W. C. Plowden, Esq., c. s., Simla.

CONTRIBUTIONS.

1. Report on the Government Botanical Gardens, Saharnpore, 31st March, 1880. From the Superintendent.

2. Transactions Asiatic Society of Japan, Vol. IX. Part 1. From the Society.

3. Proceedings Asiatic Society of Bengal, for February, 1881. From the Society.

4. Proceedings Agri-Horticultural Society of Madras for March, 1881. From the Society.

5. Memoirs, Vol. VI. and Proceedings Vols. 16 to 19 of the Literary and Philosophical Society of Manchester. From the Society.

6. Catalogue of Plants in the Royal Botanic Garden, Mauritius. From the Director.

7. The Tea Cyclopædia. From the Editor.

8. Seeds of Amherstia nobilis from Moulmein. From Major R. W. Fanshawe.

9. Seeds of Cupressus of three kinds, from the Botanic Garden, Saharnpore. From the Superintendent.

10. Seed of *Panicum spectabile*. From the Agri-Horticultural Society of Madras.

11. Seed of Bamia cotton, and a specimen of the cotton. From W. F. Westfield, Esq.

Mr. Westfield mentions that this cotton (9 tolas) and seed (26 tolas) is the produce of one plant grown in a large pot on the terrace of his house; the plant is two year's old. The cotton is pronounced equal to ordinary Egyptian. The seed had germinated freely in the Society's Garden.

Mr. R. B. West sent for exhibition a healthy well grown plant, in full flower, of *Hemianthus cinnabarinus*, a new variety, introduced in England in 1879.

GARDEN.

The Superintendent's report was submitted. The following are extracts:—

The weather has been very trying of late, and the garden labour has been fully occupied in artificial watering, but the showers of the 14th, 15th, and 19th current, released the men for other urgent work. Begonias and other delicate plants have suffered much from the heat.

The manure presented by Mr. H. A. Firth is leaf mould strongly ammoniated. The bed to the south of west tank, mentioned in preceding report as the spot where some imported Rose plants had been planted out, was freely manured with it; the first effect was to produce a minute insect which almost destroyed all the leaves, but in a very short time the insects disappeared, and the plants have the healthiest appearance in the garden. Mr. Firth has also presented to the garden 15 *Stephanotis floribunda* and a quantity of *Combretum* seed; this latter will be reported on hereafter.

On the morning of the 19th instant, the plot of ground on which tomatoes were grown, was ploughed up by Mr. Stalkartt's plough, the ground was rather stiff, the last fall of rain having been on the night of the 15th instant, the furrow was 5 inches deep by 14 inches wide, the ploughman and bullocks working with ease, and without any special strain. I prefer this to any of the other ploughs that I have yet tried in the garden, as from its peculiar construction and operation, the entire ground passed over is disintegrated, and has also the advantage of being adapted to different size bullocks. The cost seems rather too high for the ordinary agriculturist. Mr. Stalkartt says this can be modified, so as to bring it within their means.

The demand for fruit grafts appears to be increasing, and I would recommend preparation being made in time for grafting operations on a large scale.

The present system of drainage is defective, and as opportunity offers will be improved, so as to augment the tank supply. Caladiums have sprouted, and are now making a fine show. Out of the lot of Rose plants received from Mr. Bull on the 26th ultimo, 92 are doing well, 28 are likely to recover, 82 dead. There is very little else for special report, but I take this opportunity to allude to the following donations to the garden:—

Phalaenopsis, several varieties, presented to the garden some time since by Col. W. M. Lees, have been transplanted from their original boards, where they were rather too thick, and have given quite a gay appearance to the temporary Orchid House, as the flowering has been constant and abundant.

Avocado Pear seeds presented by Col. Lees; germination very fair, and plants doing well.

White Pumplenose seed presented by Mr. C. E. Blechynden; germination good, plants doing well.

Mignonette seed, presented by the Secretary; splendid germination, and large quantity of seeds collected from plants.

Several varieties of acclimatized flower seeds, presented by Col. H. R. Wintle; results good, both as to decorating the garden while in flower, and outturn of seed.

Mignonette seed presented by Mr. T. M. Francis; results in flower and seed admirable.

From Mr. W. Galiffe, 2lbs. Arabian Coffee seeds; germination capital, plants are very healthy and ready for issue; these plants seem admirably adapted to the climate of Bengal.

Musa seed from Herbert River and *Cassia magnifolia*; germination very fair, and plants are likely to thrive. Presented by Mr. A. L. Bernays. Several varieties of *Eucalypti* seed contributed by the same gentleman; none of these have germinated yet. I may observe that some time since, I noticed a plant of *Eucalyptus globulus* at the Entally Orphanage some eight feet high, as well grown as any I have seen in Australia, I mention this as I believe they have not been found to succeed in Bengal. Five varieties of Maize presented by Mr. C. Girdlestone from Nepal have germinated, and will be planted out shortly.

Nurma Cotton seeds presented by Captain Pogson have germinated very well, and will be further reported on hereafter.

Amherstia nobilis seed presented by Major Fanshawe. None have germinated for reasons already given in previous garden report in May 1880, but I think another attempt should be made to propagate this very handsome plant by seed, and with the next lot received a different treatment than has hitherto been observed, will be tried.

Bamia Cotton seed presented by Mr. W. F. Westfield has germinated well, will be planted out and reported on hereafter.

Layering of Rose plants begun this-day.

PARTICULARS BEGAEDING THE SIRGOOJA OR RAMTIL.

The Secretary placed on the table a copy of the *Calcutta Gazette* of the 13th April, containing an account of the "cultivation of the Sirgooja plant in the Nuddea district." This plant is said "not to be an indigenous product of the Nuddea or any adjacent district, but is reported to have been brought originally from Chota Nagpore, where it is said to be in extensive cultivation." It was introduced into the Nuddea district about 30 years ago.

The subject of this oil-yielding plant has attracted the attention of the Society at various times during the past 30 years. It was first brought to notice by a then Member (Mr. T. M. Robinson) in 1849, when resident at Ranchi. Mr. Robinson sent a specimen of the seed, and stated that its oil is used for food by the poorer classes all over Chota Nagpore, who raise it in large

quantities for this purpose. He thought that this seed would yield more oil than an equal quantity of any other he had seen, owing to the extreme slightness of its skin.

This seed at the time alluded to was produced in Burdwan, as also in Beerbhoom, Midnapore, and other districts of Bengal, where it is employed for the same purposes as in Chota Nagpore. Colonel Sykes had previously reported the plant to be cultivated also on the other side of India, though under another name "karleli," (*An account of the cultivated oil and cordage plants of Dekhan*). Experiments were made by Mr. E. Solly with this and other Indian oil-seeds some thirty years ago, which shewed that it yielded about 35 per cent. of oil or 10 per cent. less than Til-seed (*Sesamum orientale*), known in commerce as the gingelie oil.

This seed is identical with the Niger seed of commerce, and is largely imported into England under that name from the Western Coast of Africa. It is also exported from Calcutta, but being included with several other oil-seeds it is difficult to say the quantity that has been recently shipped.

It was subsequently reported to the Society, that the Sirgoja cake was unfit for cattle feeding owing to its horny excrescence, and could only be used for manure. This has, however, been since overcome, for it has been so excoriated that cattle can be fed on it without causing any injury.

This Sirgoja or Ramtil, is the *Verbesina sativa*, Roxb : *Ramtilla oleifera*, Wight : *Guizotia Abyssinica*, Cass. The original sample presented by Mr. Robinson in 1849 was placed on the table, as also a sample of the oil presented by Baboo Peary Chand Mittra in 1852.

The export of Sirgoja seed is trifling as compared with other well known oil seeds, such as Lin, Poppy, Rape, Til, and Castor. The export from all parts of India of these seeds during the official year 1880-81 may be valued at about six millions sterling. It would be very desirable if a large proportion of this seed could be converted locally into oil and exported in that shape, seeing how much would be saved in freight. Moreover, the refuse for manure and cattle food would be most valuable, especially for the latter purpose, when so many thousands annually die from want of nourishment.

THE CURATIVE PROPERTIES OF EUPHORBIA PILULIFERA.

The Secretary next read the following note by Mr. P. Doyle, c. z., dated from Queensland, 12th February :—

Euphorbia pilulifera is the botanical name of a plant occupying public attention at present in the Colony as a specific for diseases of the chest. The plant is only known by its scientific appellation. For technical description, see *Flora Australiensis*, Bentham and Mücker, page 51. It is a very common tropical weed, procurable in India and Burma. Once seen, it is easily distinguishable from other plants. When broken the stem yields a white viscid liquid, very acid in taste, possessing strong emetic and corrosive properties. The Euphorbia

family has a great many varieties. Some grow in Europe, but it is only in tropical regions that the poisonous varieties are found. The plant referred to has in some cases a bronzed appearance, nearly resembling "pig-weed," but not having the fleshy leaf of that plant. Its seeds are in small knobs close to the stem. The decoction has not only been found efficacious in pulmonary affections, but its curative properties extend to other disorders. Being a poisonous plant, it should be used with caution.

NOTICE RESPECTING GOSSEYPIUM ARBOREUM OR TREE COTTON OF THE DECCAN.

The paper next submitted was from Captain J. F. Pogson, on the above subject. By this post, I have sent to your address, for valuation, and subsequent submission to the President and Council of the Agri-Horticultural Society, a sample of seeded cotton wool, of the "*G. Arboreum*," raised at Saharunpore, in the Government Botanical Gardens, under the Superintendent, Mr. J. F. Duthie, F. L. S.

I have ever since 1869-70-71, advocated the introduction and cultivation of this valuable cotton producer, and in 1871, whilst at Kussowlee you were so good as to send me a supply of the seed, obtained from the Deccan.

I am not quite certain but to the best of my recollection I sent a portion to the Officer then in charge of the Saharunpore Botanical Gardens, and with whom I had been in correspondence on the subject of grafting the "*Ficus elastica*," on the "*Banyan*," tree or "*Ficus Indien*," (I sent some of the seed to two friends residing in Umballa, but I never heard of the result of their trial), and it is by no means improbable that the cotton now sent, is derived from trees raised from the seed alluded to.

The fact, that the cotton tree of the Deccan will grow in Upper India having been undeniably established, I think the ventilation of the subject, through the Proceedings of the Agricultural and Horticultural Society, will have a most beneficial effect, and lead to its general introduction into the Doon, and all places, where sugarcane is known to flourish in the N. W. Provinces.

In the Punjab, I am certain, that if properly introduced under official sanction, the cultivation of the "*Gossypium arboreum*," would be found a very profitable undertaking.

I would suggest, the "*Chunga Munga*," Fuel Plantation, as a good locality for forming a Government Cotton Tree Plantation and Nursery for the distribution of plants to all applicants.

The seeds sown in beds, would soon yield an ample supply of seedlings, and these when sufficiently advanced, could be planted out in all directions, where space could be found between growing trees. The transplanting operations if carried out during the rains, would meet with success, and thereafter the plants would soon be able to take care of themselves, for

this cotton, being a sun-plant, will not need irrigation after being once fairly established, and as it will bear cotton wool pods, within twelve months, and yield them for nine months out of the twelve, and do so year by year for twenty years, every thing is in favor of its introduction. As "kunker," which will yield lime, (chunam), when burned, is procurable in most parts of the Punjab, it should be used as a mineral manure for the *Gossypium arboreum* seedlings. The "kunker," should be reduced to coarse powder, (without being calcined), and two seers of it should be mixed with the soil, excavated for putting down a seedling. Thus one mound of "kunker" powder would be needed for every twenty *Gossypium arboreum* seedlings, and this manuring should keep the tree well supplied with carbon for at least ten years, when a fresh supply might be applied and dug in. The yield of cotton wool would very soon cover all outlay for preparing the excavations for seedlings and "kunker" manuring, and thereafter 75 per cent. of the produce might be put down to profit, and 25 to cost of collection, packing, cleaning, and transit. As the plantation is preserved, and is well stocked with game, hares may be present in numbers, and if so, thorn bushes will have to be put around each seedling till sufficiently grown. This will keep off deer, and antelope as well.

I do not think the Officers of the Forest Department would object to the introduction of the *G. arboreum*, and it would go far to make the Fuel Plantations more than self-supporting. I would recommend the utilization of convict labour for digging the holes, and pounding the "kunker," so that the actual outlay would be very trifling.

To private parties, being landed proprietors, I would recommend the regular formation of "*Gossypium arboreum*" plantations, one hundred and sixty trees being allowed to each acre. When the trees are six feet in height, the land between them should be ploughed, and manured preparatory to being sown, or planted with ground nuts, i. e. "*Cheena Boodam*," or "*Moong Phullees*," (*Arachis hypogea*.) and I venture to predict, that if "kunker" dust, or any sort of limestone reduced to powder, be freely used as a mineral manure, that heavy crops of cotton wool and ground nuts will annually be secured.

In conclusion I would wish to mention that from March 1879 to present date (March 1881,) I have regularly used limestone reduced to powder, as a mineral manure for vegetables and fruit trees, and have found it most valuable. In the spring of 1879, I put down a seedling flat, or China Peach, about 3½ feet in height, it is now nearly twelve feet in height, and well supplied with flowers. This year's growth has yet to commence. I used soft limestone rich in fossil shells as a manure, and with it was mixed calcined bones reduced to powder, and moistened with water holding saltpetre in solution. Peaches are rapid growers, but as the other five seedlings, (I had the sixth given to me,) are nowhere in comparison, the growth is beyond doubt due to the lime-powder. The stone was not fired.

The Secretary stated that a few particulars regarding this fine description of cotton were communicated to the Society many years ago (1842) by the then Agent to the Governor-General in Bundelcund. The seed received from Captain Pogson has germinated most freely in the Society's garden (*See Superintendent's report above*) and will be carefully attended to.

It was agreed that a copy of Captain Pogson's paper be sent to Dr. Brandis, Inspector General of Forests.

REMEDY FOR CATTLE DISEASE.

Letters were read—

From Messrs. Octavius Steel & Co. applying for seed of the Potentilla, the leaves of which are stated to be a remedy in certain diseases of cattle (*see Mr. Lennox's paper in recently published Number of the Journal, Vol. vi. Part 3*).

From P. DeLaval Lennox, Esq., of which the following is an extract:—

"Yours of 9th instant, I have begun collecting Potentilla leaves for drying. I suspect I shall be at least a week collecting enough for a 5 lb. packet, having only my son to put on the work. Every available Aryan is 'on leaf' in the Tea Plantation. Though sorry any one's cattle should be afflicted, for *myself*, I am glad there is a Tea Garden with virulent cattle disease on it where the efficacy of the Potentilla may be fairly tried, and I hope fervently that it will be found a real cure.

It is heart-breaking work having to do with natives, especially Hindus, in such a matter as cattle disease. One will not tell another the medicine for fear of destroying its efficacy on his own cattle while ill. Another whose cattle have been (so it is told to me) cured, does not care one iota whether his neighbour's cattle live or die. All cattle and persons residing with them at the time of the disease being ascertained to exist there, are put into strict quarantine within the particular homestead. Brethren or relatives outside, must either remain far outside, or submit to quarantine along with the rest if he goes near the place to talk with his people. No one will report the disease for fear his own cattle will fall ill though mentioning its name. Each man will tell the Sahib that the medicine worked wonders, and tell his own people that the recovery of the cattle was not due to the Sahib's medicine, but to some holy water or "muntra" or "Jhup Sup of his Gooroo or says "it will live or die according to fate" and so forth, till one feels utterly uncertain. Even Tehsildars go on the principle "it is necessary to send replies according as it may seem desirable to the district or zillah officer."

The Palampur Tehsildar tells me that lately the Potentilla has been effecting many cures up in Kulu, so its Tehsildar reports.

The Palampur Tehsildar says also that the Potentilla has really effected wonderful cures to his personal knowledge. I asked him to tell me the real truth without fear or favor as he could get neither promotion or reduction from one who is only a Tea Planter, and I think he did speak the truth, and know does try to get the people to use this remedy by all the persuasion in his

power; but your Tea Garden applicant will, I feel sure, give an unbiased report, whether effective or the reverse. All I want is the real fact so that if it is good I may be able to work stronger in its favor and if non-efficacious avoid making a fool of myself and others about it.

I am to-day despatching about $1\frac{1}{2}$ oz. of Potentilla seed, not the wild edible strawberry, to you by to-day's post, and if they germinate and grow shall esteem it a great favor if you will let me know the classification and nomenclature of the plant so that in writing about it its identification will be certain.

From Captain Pogson in reference to the following:—"At page 160 of Vol. vi., Part iii., of the Journal"—writes Captain Pogson—"there appears the following from Mr. F. Tucker, Assistant Commissioner. 'I on the same date sent one (a special) to the Mundi Raja, from whom the Sukeyt Raja had been asking what is this:—“*Ishtaurbhugri-Dawai*.’’ This long word is only Paharree corruption of the English word “Strawberry,” and a note to this effect would be useful in the next proceedings. We have two kinds of strawberry growing wild. The Alpine, on Huttoo and Narkunda, and the common wood strawberry, all over the jungle.”

MONSTRE PUMPKIN OF SOUTH AMERICA.

Read another letter from Captain Pogson in reference to the large pumpkin of which he sent seeds last year and which were distributed but of which, unfortunately, no record was kept. "I should be much obliged" writes Captain Pogson—"if you would insert a short paragraph in the next proceedings on the subject of the "maha kuddoo," and as I am much in need of some of the seed grown last year, it might thus be forthcoming.

Thursday, the 26th May, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Messrs. A. H. Collins, C. S., W. Innes, Alfred Bridge, J. A. Anderson, T. S. Anderson, H. E. M. James, C. S., James Paterson, and T. H. Kerswill; Lieut-General Dhoje Nursingha Rana Bahadoor; T. C. Pandè, Rajah of Pakour, and the Secretary, Public Garden, Baugulpore.

The names of the following gentlemen were submitted for Membership:—

His Grace the Most Rev. Dr. S. Goethals, Archbishop of Hieropolis,—proposed by Dr. G. King, seconded by Mr. M. Rustomjee.

Baboo Shamlall Sen, Zemindar, Goureepore,—proposed by the Secretary, seconded by Baboo P. C. Mittra.

A. A. Shircore, Esq., Barrister-at-Law, Jullundur City,—proposed by the Secretary, seconded by Mr. H. A. Firth.

Lieut-General Umer Jung Bahadoor Rana, Nepal,—proposed by Lieut-General Dhoje Nursingha Rana Bahadoor, seconded by Baboo P. C. Mittra.

S. Gowan, Esq., Serajgunge,—proposed by Mr. J. G. Meugens, seconded by Mr. A. Wilson.

Edward Cleveland, Esq., Zemindar, Secunderabad, Zillah Bolundshuhur,—proposed by the Secretary, seconded by Mr. J. G. Mengens.

W. E. Crum, Esq., Merchant, Calcutta,—proposed by the President, seconded by Mr. H. A. Firth.

Hamilton Martin King, Esq., Gooabur and Barabanki Tea Estates, Julpigarree,—proposed by the Secretary, seconded by Mr. Mengens.

D. Cruickshank, Esq., Calcutta,—proposed by the Hon'ble A. B. Inglis, seconded by Mr. Wilson.

Dr. D. O'Brien, Romarie Factory, Debrooghur,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

J. H. Barry, Esq., Merchant, Calcutta,—proposed by the Secretary, seconded by Mr. W. H. Cogswell.

W. Palmer, Esq., Examiner, Telegraph Accounts, Calcutta,—proposed by Mr. W. Stalkartt, seconded by Mr. J. F. Westfield.

Manager, Debrooghur Division, Upper Assam Tea Company,—proposed by the Secretary, seconded by Mr. Wilson.

Manager, Blackburne Tea Garden, Assam,—proposed by the Secretary, seconded by Mr. Wilson.

C. H. Moore, Esq., Merchant, Calcutta,—proposed by the President, seconded by the Secretary.

Rejoined—C. Brock, Esq., Calcutta, S. U. Phipps, Esq., Calcutta, and Rajah Kistreindra Narain Roy, Zemindar, Bolikar, Rajshaye.

CONTRIBUTIONS.

1. Records of the Geological Survey of India, Vol. 14, Part 1. From Government of Bengal.

2. Journal of the Bombay Branch of the Royal Asiatic Society, No. 38, Vol. 14. From the Society.

3. The Indian Forester, Vol. VI., No. 4. From the Editor.

4. Proceedings of Annual Meeting in March and Proceedings for April 1881, of the Madras Agri-Horticultural Society. From the Society.

5. Journal Asiatic Society of Bengal, Part 1, No. 1 and Part 2, No. 1, and Proceedings for March. From the Society.

6. Memorandum on Dyes of Indian growth and production, by J. Liottard of the Agricultural Department. From Government of India, Department of Agriculture.

7. A few plants from Singapore—Orchids, Ferns, and Fruit trees. From E. Kock, Esq.

8. A small quantity of seed of *Sorghum saccharatum*. From Mr. R. B. West.

Mr. W. F. Westfield sent for inspection a plant of Bamia Cotton raised from the seed which he has recently brought to the notice of the Society and

which gave so great an yield. The seed from which this plant was raised was sown in a large pot at end of February, and is now in a most vigorous state both flowering and podding : it is nearly 3 feet in height.

GARDEN.

A report was submitted by the Superintendent of which the following are extracts :—

"There would have been very little of special interest to report this month, were it not for the severe storm on the night of 10th instant. The damage to well grown plants in the orchard and ornamental plant portion of the garden has been considerable, very many trees having been entirely blown down. Such as are likely to recover have been propped up. The damage to the three plant sheds (covering 250 feet by 50 feet) was great, all of them having been blown down, &c. The plants which were sheltered under same have been considerably injured, one of the sections of shed to west of residence measuring 60 feet x 40 feet has been reconstructed since, and the rest will be shortly completed.

The glass houses suffered considerably by the storm as well but have been repaired since.

The injuries caused by this storm, and time occupied in repairing damages, have necessarily retarded the distribution of plants to Members whose applications were registered, but we hope shortly to recommence work.

REPORT ON FLAX RAISED ON THE CAWNPORE EXPERIMENTAL FARM.

Submitted a letter from the Officiating Director, Department of Agriculture, N.-W. Provinces, and sample of the Flax therein referred to for an opinion as to its quality and value.

Submitted the following notes of the Fibre Committee thereon :—

Mr. W. H. Cogewell.—I consider this well grown and nicely prepared, of good strength, but the staple is very irregular in length and size, soft fibre and bright color, altogether a very good and most desirable product, and easily saleable in the European markets and would command good prices. Some of it has been too much combed, imparting almost a towly appearance, and it would have been better had the sample been divided in order to separate the long from the short and irregular staple. Its value per ton is somewhat difficult to arrive at unless a large sample of it was sent to England; approximately I should say it might be worth £35 to £40 a ton. No mention is made from what seed this has been grown, nor result per acre in weight. It would be desirable to give such details whenever samples are sent for report.

Mr. W. Stalkeartt.—Sample dressed flax, long and short mixed, quality appears very good. As no other flax ever comes to this market it is difficult to give a valuation. If all long flax it might be worth £35 to £40 in the English market.

Mr. S. H. Robinson.—I agree with the above remarks as to the want of regularity in the fibres, and their general character, but would not value them

so high. Last month's Dundee quotations were £29 to £37 per ton the latter for the best Archangel. Probably £30 to £32 per ton would be a more correct valuation, being the rate for good Riga.

MANILLA HEMP.

Read a letter from the Assistant Secretary, Government of Bengal, Financial Department, Agriculture, forwarding copy of a Memorandum by Surgeon-General Balfour, on the cultivation of Manilla Hemp in India, with reference to the Report by Mr. Liotard, of the Agricultural Department, on the materials in India, suitable for the manufacture of paper, and requesting the favor of any remarks which the Society may have to make on the subject.

The Secretary read the following note, and stated that Surgeon Balfour's Memorandum had been introduced in the 'Monthly Proceedings of February last :—

" From the Transactions of the Society, it would appear, that its attention was originally drawn to the Manilla hemp plant (*Musa textilis*) so long ago as in the year 1822; some useful papers regarding it were subsequently published in 1840. An attempt was made to cultivate this valuable fibre-yielder in the Society's old garden in 1836; but after trials for three or four years, the cultivation seems to have been abandoned. From this fact, it may be assumed, that it did not succeed, though there does not appear to be any record to this effect. It may be that Lower Bengal is too low for its profitable culture, for hilly land would seem best adapted for it. Attempts might be made to cultivate it in some parts of Upper Bengal (Monghyr for instance) where there is a fair elevation.

The Society would, however, be glad to renew the attempt in the spot, in its present garden, which has been recently set apart for economic cultures, if the Government would obtain a supply of plants from the Philippine Islands, or from the Andamans, where there is a plantation, on the produce of which a report was furnished last year by the Society."

In connection with the above, the Secretary laid on the table, applications from the Superintendent, Botanic Garden, Saharunpore, and the Superintendent, Public Garden, Hoshungabad, Nurbudda Division, the former requesting plants and the latter plants and seeds of the Manilla hemp plant and instructions in respect to soil, mode of cultivation, &c. The Secretary intimated he had afforded partially the information required, and stated that there were no plants in the Society's Garden.

PLANTAIN FIBRE.

The next papers brought to notice were a letter from the Secretary, Chamber of Commerce, forwarding the specimens of plantain fibre with a letter from the Government of India, and requesting on behalf of the Chamber, a report on the same.

The following is the letter from the Government of India :—

"I am desired to bring to the notice of the Chamber of Commerce the accompanying paper* by Mr. Liotard, of this Department, Paragraphs 1 to 22. describing a process which he suggests for the extraction of the fibre of the Manilla hemp. It will be observed that it is also proposed to apply this process for the extraction of the fibre of the varieties of the Plantain tree which are found in hill tracts or elevated plateaux in India.

2. Some fibre has been extracted by this process from the Bengal variety of the Plantain tree, called in the vernacular *kanch kella*; and I am to forward herewith a sample of the fibre thus obtained for submission to the Chamber of Commerce. It is known that the fibre produced from this variety is inferior in quality to that of the upland or the Philippine species, besides being relatively less in amount; but it has been operated upon because it was readily available, with the object of putting the process suggested to a practical test.

3. The Government of India would be glad if the Chamber of Commerce would favour this Department with its opinion on the value of the sample, stating whether it would be marketable as material for paper manufacture, or for cordage and textile fabrics, and what the price of the stuff would be per ton in this country and in England. I am also to invite any remarks the Chamber may see fit to make upon the paper by Mr. Liotard.

Note by Mr. W. Stalkartt.—These specimens are very prettily got up, are much too good for paper making, but might be useful for cordage. It is impossible to quote values on such minute specimens.

FIBRES.

The Secretary next called attention to some fibres prepared from certain Malvaceous plants (*Abutilon*, *Urena*, *Hibiscus*) which had been forwarded by the Forest Officer at Kolhapore (Bombay Presidency) for report. He had informed him, in reply, that these were of little or no value, except for local purposes.

Letters were read—

From Clements R. Markham, Esq., c. b., dated London, March 27th in reply to an application for seed of Cuzco Maize and Quinua seed for trial in the Himalaya, as suggested by Captain Pogson.

"A good supply of quinua seed,—writes Mr. Markham,—was sent out to the Government of India in 1874, which I obtained through Messrs. Antony Gibbs and Sons of Lima. Mr. Hume said it was *bathu*, but this is a mistake, *bathu* is the "Chenopodium album" of the Punjab, which grows on the plains and is not a hill product. Quinua is the "Chenopodium Quinua," which is cultivated at very great elevations. I suppose the Government gave a portion of the quinua seeds, sent out in 1874, to the Agri-Horticultural Society of India. [The Society did not receive any.] I trust this was so for I fear that, in the present state of affairs in Peru, it will be difficult to get fresh supplies for some time to come. All the chief ports are occupied by hostile Chilian forces, there is no communication with the interior and many of the Merchants have left.

It is quite uncertain how long this will last, but I will bear in mind your wishes, both as regards Cuzco Maize and Quinua. Meanwhile I will consult Messrs. Gibbs as to the prospect of renewing communication with the interior of Peru."

From P. deLaval Lennox, Esq., of Bhawareea, Punjab, forwarding a quantity of leaves of a *Potentilla*, a supposed remedy in certain cases of cattle disease. This has been transferred to Messrs. O. Steel & Co. for division among their tea gardens which are chiefly affected.

From L. A. Bernays, Esq., late Vice-President of the Queensland Acclimatization Society, tendering his best acknowledgments for election as an Honorary Member of this Society. "I hope it will be remembered"—adds Mr. Bernays—"that my services are always at the disposal of the Society, and that I shall at all times be happy to receive and afford my best attention to any communications which may be addressed to me on its affairs."

Thursday, the 23rd June, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members:—

His Grace the Most Rev. Dr. S. Goethals, Baboo Shamlall Sen, Lieut.-General Umber Jung Bahadoor Rana, Messrs. A. A. Shircore, S. Gowan, Edward Cleveland, W. E. Crum, H. M. King, D. Cruickshank, J. H. Barry, W. Palmer, C. H. Moore, Dr. D. O'Brien; Managers, Debroghur Division, Upper Assam Company, and Blackburne Tea Garden, Assam.

The names of the following gentlemen were submitted for Membership:—

A. W. Hurle, Esq., Serajunge,—proposed by Mr. J. G. Meugens, seconded by Baboo P. C. Mittra.

J. E. Weingartner, Esq., Locomotive Department, Saidpore,—proposed by Mr. T. Walton, seconded by the Secretary.

The District Engineer of Jessor,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

Baboo Rakhal Dass Holdar, Manager, Chota Nagpore Estate, Ranchi,—proposed by Baboo P. C. Mittra, seconded by Baboo P. C. Ghosa.

Cunningham Hudson, Esq., Merchant, Calcutta,—proposed by Mr. W. H. Cogswell, seconded by Mr. W. Stalkartt.

The Manager of the Rungting Tea Company, Darjeeling,—proposed by Mr. Albert Smallwood, seconded by the Secretary.

Baboo Amrita Naryan Acharja Chowdry, Mymensing,—proposed by Mr. R. de Dombal, seconded by Baboo P. C. Mittra.

Captain W. H. M. Francklyn, Tonghoo,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Rejoined—T. F. Hamilton, Esq., Merchant, Calcutta.

CONTRIBUTIONS.

1. Records of the Geological Survey of India, Vol. 14, Part 2. From the Government of Bengal.
 2. Report of the Committee of the Bengal Chamber of Commerce for half year ending 30th April. From the Chamber.
 3. Introduction to the annual accounts of the Sea-borne trade and navigation of the Bengal Presidency for 1880-81. From the Collector of Sea Customs.
 4. Journal of the Asiatic Society of Bengal extra number to Part 1 of 1880; and Proceedings for April 1881. From the Society.
 5. Seed of *Reana luxurians*. From T. T. Allen, Esq.
 6. Seed of *Pinus longifolia*. From the Superintendent, Botanic Garden, Saharunpore.
 7. Seed of *Pithecelobium saman* (Guango.) From the Agri-Horticultural Society of Madras.
 8. Seed of the Carob tree (*Ceratonia siliqua*.) From the Agri-Horticultural Society of the Punjab.
 9. Sorgho seed of the red variety (*Sorghum saccharatum*.) From the Director Department of Agriculture, N. W. Provinces.
- The above seeds are available to Members.
10. A small collection of Orchids and seeds from the Andamans. From O. H. Brookes, Esq.
 11. Specimen of white gram and sunflower seed. From R. Nicholson, Esq.

GARDEN.

The following are extracts from the Superintendent's monthly report:—

"The weather has been propitious for propagation. Advantage has been taken of the early rains for gootying and grafting in the Orchard, and I anticipate the garden will have sufficient grafts to meet the increasing demand for this class of plants.

Our stock of beautiful and rare plants having attained sufficient growth, are now being propagated from, and I hope that at the close of the rains, they will be sufficiently augmented to meet general demands. There are many beautiful plants available for issue in the garden, but they are so numerous, that I fear it would make this report too lengthy to include them in it.

Manure experiments.—The following have been sown,—Maize, bujra, sun dharus, in the economic portion of the garden, under the same conditions, as at the experimental farm at Bangalore; the seed has germinated well, and in due course will be reported on.

Over half an acre of ground is now planted out with American maize seed, acclimatized at Nepal, and presented by Mr. Girdlestone last year to the Society. This seed germinated well, and the plants are looking vigorous and healthy, and will be fully reported on hereafter.

Panicum spectabile— Raised from seed, occupy a small plot in our economic garden, and are making vigorous growth.

The greater portion of the sheds destroyed by the storm, has been re-erected, but has somewhat interfered with ordinary current work; it is now desirable that Members should indent for their annual supply of plants, so as to make room for fresh propagation. The two tanks are filling rapidly under an improved system of drainage. The tank at the west entrance being higher than it was after the rains last year, we may hope to have a full supply of water for next dry season.

I would draw attention to the large supply of useful plants now available for issue, among them Teak, *Casuarinas* and *Inga saman*. Also to the very large quantity of Arabian Coffee seedlings. Stock of Rose plants available are varied and considerable, also Crotons. The garden has now in addition to its previous collection of Orchids, a fair number of *Vanda giganteum*, *Vanda Lowii*, *Dendrobium Dalhousianum*, *Cypræpedium*, &c. Also a considerable quantity of *Memecylon tinctorium*; this charming plant when in bloom has its branches covered with dense clusters of cerulean blue flowers of a pleasant perfume. I may add that one of our *Agaves* has flowering spikes on it, affording a good opportunity for any Members desiring to make a hedge.

Having succeeded in forwarding a parcel of violets per post to Simla which is reported to have arrived in splendid condition, I think I may safely venture to say, that for the next six months at least, this method, if adopted for Mofussil members in remote stations, and not over a weeks transit, will enable them to realize their full privileges which to a great extent has hitherto been either permitted to lapse, or given to friends in Calcutta. Crotons, Coleus, Palms, and many other plants in their infant stage can be specially packed; the postal charges are trifling.

The multiplying power in propagation of plants in this garden is unlimited and with the minimum of cost in transit thus suggested, a fair outlet for plants from this garden should be created, the interests of Flora and Horticulture advanced, and the very natural sequence of an increased demand, the lowering of expenditure, *pro rata*, in disbursement of plants.

The garden servants have enjoyed special immunity from fever during the period that it was raging in the neighbourhood; I encouraged them to eat the green papaya cooked as a curry, the men being permitted to take the fruit from the garden gratis.

The Lady Superior of St. Vincent's Home informs me, that since she has planted Neem trees "Azadirachta," in her grounds, the inmates have been specially exempt from fever; probably this plant possesses fever dispelling properties, and as the seed can be procured for the gathering in Calcutta, the experiment of planting the same in the fever districts is worth trying. The plant is easily raised and needs no special care."

In connection with the virtues ascribed to the "neem," tree in the above report the Secretary drew attention to the fact stated in O'Shaughnessy's *Bengal Dispensatory* that Dr. White, of Bombay, used the bark of this tree as a substitute for Cinchona and found its success nearly equal as a febrifuge remedy. He further submitted a note from Dr. D. O'Brien, of the Beheating Estate, Debrogurh, applying for seeds of *Eucalyptus rostrata*. Dr. O'Brien states that he raised some plants of that variety five years ago, and they are now 25 to 30 feet high, but very slim. "They were planted about the compound of my bungalow, and to these trees I must attribute our complete freedom from fevers, although the people (coolies) about are very subject to fevers."

EXHIBITION OF MODELS OF AGRICULTURAL APPLIANCES.

Read a letter from the Secretary to the Government of Bengal, dated 11th May, suggesting that the Society undertake the formation of a collection of models and drawings of Agricultural appliances for which the Lieut.-Governor is willing to grant a sum of Rs. 500. The Society having previously agreed to grant space for such exhibition.

Read also a preliminary report from a Sub-Committee of the Council stating what in their opinion would be the best mode of meeting the wishes of Government.

Resolved, that a copy of this report be forwarded to Government in reply to the Secretary's letter.

TRIAL SHIPMENT OF FRUIT FROM MELBOURNE.

The Secretary next submitted an interesting and useful memorandum, prepared by Mr. James Inglis, Executive Commissioner for India, at the recent Melbourne Exhibition, copy of which he had been favored by the Hon'ble A. B. Inglis of this city.

The following are extracts from this memorandum:—

"In previous papers issued from this Court by Mr. Buck on the subject of the export of Australian produce to India, it has been noted, that in any dealings on a large scale, it is of little use to study the requirements of the European residents. The wants of the natives must be ascertained, and if these can be met, the trade is worth consideration.

Fruit of all procurable kinds is greatly in demand by the natives of India, especially in the northern parts, where fruit is scarce; and where there is a numerous middle class who can afford to buy it.

Large quantities of apples used to be brought to Calcutta by the Ice ships from America. The multiplication of Ice machines of late years, has somewhat checked this supply; but there is still the same demand as formerly.

Apples dried and fresh, dried apricots, figs, raisins, pistachios, almonds, walnuts, pomegranates, and grapes, &c. are imported from Afghanistan.

Dried fruits and nuts in the largest quantity. The cost of carriage is great, as hundreds of miles have to be traversed by the camels who carry the fruit.

The statistics for importation from Cabul and Candahar, taken from the Inland Trade Returns, are about £120,000 worth yearly.

The price of apples, of smallish size, at Cawnpore, in the centre of Northern India and in Calcutta is about a rupee, or from 1s. 6d. to 1s. 8d. a score. The grapes are of a long whitish kind, with thickish skins, very sweet, and they are packed in round chip boxes, three rows to each box. Each grape is cut from the bunch and laid separately on layers of cotton wool. In this way they bear long journeys, a large per centage keeps good for months, and they sell in Calcutta at an average of about a rupee per box. I estimate each box to contain say about 100 grapes.

It is proposed by Mr. Buck, Director of the Department of Agriculture and Commerce, N. W. Provinces and Oudh, and President of the Indian Committee for the M. I. E. to send from India to the Horticultural Society of Victoria, samples, prices and other information of all the fruits imported; and the information thus obtained will doubtless appear in the Society's annual report.

The apples are being packed in different ways, and the present shipment is in fact purely an experimental one, with a view to gather useful hints from the result whatever it may be. Every method and every season should be tried; say by following this up with small shipments monthly, until the right plan and right season are definitely ascertained. Dried fruits especially should be tried, and the best mode of drying should be ascertained by experiment."

The Secretary also read a brief memorandum which he had drawn up on the above to the following effect:—

"Having been invited by the Hon'ble Mr. Inglis, of Messrs. Begg Dunlop & Co., to be present at the opening of the boxes containing a trial shipment of apples and pears, I think it may be useful to put a few remarks on the subject on record.

This shipment was, unfortunately, through a misapprehension of the P. and O. Office, allowed to remain for 14 days or so at the Jetties, so that seven weeks had elapsed after its despatch from Melbourne before the boxes were opened, and hence they arrived under adverse circumstances. Notwithstanding this delay one-third of the contents was, apparently, in good condition, and a larger proportion would have, doubtless, reached in fair order had a better system of packing been adopted. The present mode of packing in closed up boxes, layer over layer, a dozen or so deep, is very objectionable. A much better plan would be to pack in baskets slung up in the inner deck of the steamer, or better still, (if not found to be too expensive) in crates somewhat in the same fashion as eggs are imported in such large quantities from France into England. If the fruit were carefully selected and carefully packed in the manner proposed, at least 75 per cent. should reach in good condition, as the passage from Melbourne to Calcutta occupies so comparatively short a time. Care

should also be taken in sending the best kinds of fruits. The apples and pears of this first trial consignment which I tasted were of an inferior description, the former not better than what used to be imported in ice ships from Boston.

In connection with the above I would beg to call to the notice of the meeting the fact of a small experiment in this way in January 1878, by a Member of the Society (Mr. S. H. Robinson.) Mr. Robinson brought out on the *Khedive* a hamper full of apples from Devonshire of the ribstone pippin and flatnosed pippin kinds, both keeping or store apples. In this hamper 60 were brought, lightly packed in the hamper, each in separate pieces of paper. After a voyage of 6 weeks two only had decayed, and 4 were somewhat bruised: the rest were all good and retained their flavor fairly. The hamper was kept in the cabin the first two weeks of the voyage, and for the rest of the voyage was kept cool in the ship's ice room but not in the ice."

INTRODUCTION AND DISTRIBUTION ON AN EXTENSIVE SCALE OF SEEDS OF CERTAIN KINDS OF FIELD CROPS.

Submitted various recent communications from Captain J. F. Pogson, of Simla, in respect to the introduction from other countries for distribution of seeds of certain field crops, of which the following are extracts:—

" Now that official attention has been turned to the improvement of Agriculture, Government should, I think, take up the important subject of importing certain of our field crops. For example from Benares to Meerut, the early ripening varieties of Indian corn should be imported from America. Then there is the early yellow Canada, ditto yellow Dalton, early Compton and other early kinds. Then for all districts north of Meerut later varieties would suit, and from Umballa on to Peshawur the latest ripening varieties of maize. The produce of such seeds would realize the same price in London, as the price of American grown corn. I enclose a half page cut out of "Buista Almanac and Garden Manual," for 1880 received in the box of his seeds. This Golden Millet, and the others are, I believe, unknown in India, and might also be introduced for field culture. We also want superior varieties of barley, and especially those which when properly prepared yield pearl barley.

In a second communication of 1st June, Captain Pogson continues the subject:—

" We all know, that no improvement in Agriculture is possible, without an improvement in the variety and quality of the seed sown.

Our wheats are all good, and where from bad soil the grain has degenerated, a change of seed, and the use of manure, would at once put matters to rights.

But our maize and millet grain have greatly degenerated, and fresh seed from America is most urgently needed to rectify this serious defect. This introduction of seed, I hold it is the province of the Government to supply.

I submit that too much stress cannot be laid on the subject of introducing early, second early, middle, and late varieties of maize. The object in view

being to have a variety of this most valuable cereal, which will ripen in the locality of its introduction, at the same time, as does the inferior indigenous maize, so that the ground may be cleared for the wheat, barley, and other cold weather crops. In the Northern parts of the Punjab, the late ripening maize of America would be a positive boon, and bring very considerable wealth to its cultivators. From Jullunder to Meerut, the middle ripening varieties would suit, and yield like results, and so on, going eastwards till Bengal is reached.

Let us take gram, (*Cicer arietinum*) as the next crop to be improved. Few officials in the governing circles of Simla, N. W. Provinces and Punjab, know that very large quantities of gram are consumed in Italy, and I believe in all Roman Catholic countries; (France, Spain, Austria, &c.) as human food, egg curry with gram dall may be considered fasting or mortifying diet. But I know few dishes more tasty. Leave out the curry condiments, and you have an egg stew, or as we would call it, "Egg Kormas and Gramdall."

Answer. Want of seed which Government should at once introduce. Mr. Nicholson has demonstrated that it (*white gram*) will grow in Mirzapore as well as the inferior kind, and to continue the cultivation of the latter is by no means desirable.

This undeniably superior gram, (it tastes like pea, and gram combined,) would, as a matter of course, command a very much higher price in all markets, and the producer would at once be benefited. But the hands of the Collector of Mirzapore are tied, and he cannot purchase such seed gram from Mr. Nickolson, and so the improvement cannot spread.

Let us now turn to the Punjab. From Delhi westwards, gram is very extensively cultivated; and a good deal is sent down the Indus, and from Kurrahee is shipped to Mediterranean Ports. Trieste being the principal one.

We are supposed to be on friendly terms with the Court and people of Cabul; and it follows that if the money be forthcoming, (say Rs. 1,00,000, £10,000) that no difficulty would be experienced in obtaining seed gram from Cabul and closer, for all we at present know to the contrary.

The Punjab Agriculturists would at once cultivate the white gram, the seed being given free, and the only clause being, that the recipient must retain sufficient seed for next year's sowing. To encourage extension of this cultivation for five years, prizes of turbans should be offered, and silver bangles for every ten acres of land, placed by any individual Zemindar, under Cabul gram. Thus 100 acres would entitle to ten bangles and a pugree of honor.

Rice is another grain which should be looked to, and I fear we sent to the wrong place for it. Carolina rice does not suit India, and should try China and Japan for first class seed rice. In Japan they cultivate a variety of rice, so rich in oil, or fat, that the Chinese will not eat or use it. Now this rice would suit the Hindoo exactly, who would have naturally buttered rice to eat,

with his plain boiled dall. For the London Market the seed rice of China would yield the proper article, much starch in the grain is needed, and I think the Chinese kind would yield the full supply.

In a third letter of 15th June, forwarding a specimen, Captain Pogson offers the following remarks :—

" By this-day's bangy post, bearing, I have sent you a half pound sample of a superior variety of barley, sown by me in October, 1880, and harvested on the 28th of May, 1881. I have also sent three ears of this barley, so that a satisfactory inspection and opinion may be formed as to the quality and commercial value of this particular description of barley.

In 1880, Mr. Nicholson, of Mirzapore, was so good as to send me some of this barley for sowing, and stated in his letter that the native Agriculturists held it in great estimation, and were anxious to obtain such seed barley for cultivation.

Mr. Nicholson did not mention whence he obtained the original supply of seed, so I cannot tell whether it is Indian, or from the Continent of Europe.

My fowls eat this barley with avidity, but they won't touch the common barley, thus as far as feeding poultry goes, the variety is a desideratum.

To test its value as human food, I had some ounces half roasted in a pan, (coffee bean fashion) and quantum suff put into the soup. The addition made it excellent, thus taking the place of "Pearl Barley." The imported "Pearl Barley," is much too costly for ordinary use, and British troops, I believe, regard it as a Hospital luxury. Now if the proper description of mill was forthcoming, this variety would supply all classes with indigenous "Pearl Barley," at a very cheap rate.

I have preserved my entire crop for use as seed, and will with pleasure place it at the disposal of the Council of the Agri-Horticultural Society for distribution to Members, and all who may feel disposed to cultivate it, and thus secure a good supply of seed for sowing in the cold season of 1882."

From its appearance, I am inclined to think, that it should be called "Barley wheat," the Hindoo term "*Gae jow hoon*," is perfectly applicable, and would be the popular name *Gae jow hoon*.

Mr. Nicholson has shown, that it is as easy to grow superior barley in the plains, as the inferior kind, and when this truth dawns on the native Agricultural mind, the cultivation of the common barley will be abandoned.

If Tea Planters who are Members of the Agricultural and Horticultural Society would this year import seed of the "*HOSDEUM ZEOCRITON*," of the United Kingdom, the cultivation of this barley would soon lead to the manufacture, and export of superior "Pearl Barley," and the new industry would especially benefit the Agricultural classes. The seed raised in the Himalayas, would answer perfectly in the plains, whereas imported seed sown in the plains, would, I fear, be a failure, the change of climate being so very great.

I will in due course let you know how much seed barley I possess at present, the gram has not been removed from the ear.

The Society might import the kind of mill used for converting seed barley into *Pearl Barley*, and its exhibition would lead to numbers being imported by the trade."

The specimen of barley was much admired. It was agreed to import the mill in question, as suggested by Captain Pogson, and included in the proposed collection above alluded to.

In connection with the foregoing the Secretary, when calling attention to the two specimens of *white* gram (a seer of each) on the table, referred to a letter from Mr. R. Nicholson, of Mirzapore, the donor, of which the following is extract :—

"I have been growing white gram for the last six years, but not to any extent, as I feed my cattle on oats. I originally got it from Mr. Nickells, of Benares. He told me he got it from the Maharnjah of Benares. From the want of rain, I fancy, the quality of the grain has greatly deteriorated this year. Both specimens now sent are from this year's crop. No. 1 is the fine good grains that were picked out."

The gram (especially No. 1) was considered very superior to the ordinary gram and that its cultivation should be extended.

"The barley I sent to Captain Pogson was raised from a handful of seed given to me by one of my servants some five or six years ago, he told me a man coming from Benares he believed gave it to him.

As I have a limited piece of land I have only sown a little ground to keep up the seed. Two years ago I gave two scers to one of my native officers who lives in the Jounpore district. He tells me that from his first crop he gave seed to some of his friends and that the grain is much prized, and he gets many applications for seed. He also told me the meal made from it was very superior and that the *chupaties* made from it were quite as good as from wheaten meal.

It yields much more meal than the same weight of the best native barley, and there was little loss of weight in grinding it as the proportion of bean was trifling.

Last year I sent seed to Mr. Peppè of Birdpore, in the Bustee District, he wrote to me he had a fine crop, and expected to be able to sow at least four beegahs this year, he also said it was much esteemed by his ryots, and that the only objection he saw to it was that as soon as it was fully ripe the seed-shed very much but he hoped to prevent that this year by cutting before it was over ripe."

As referring to the subject before the meeting the Secretary drew attention to an application just received from a gentleman in Oude for a large quantity of good oat seed which he wished to raise there with the view of introducing a

superior description. Such applications were constantly received not only from Members, but other residents in various parts of the country. The Society annually imported seeds of field crops, such as wheat, barley, oats, clover, lucerne, maize, cotton, tobacco, &c., but as its means would not permit of a large sum being appropriated to such purpose, it could only meet such applications on a limited scale.

On a review of the whole subject, there was a feeling in the Meeting that the introduction annually of good varieties of seeds of field crops, on a large scale, was a matter well deserving of the attention of the Government of India in its Agricultural Department.

POTATO CULTURE.

Read a letter from Colonel H. R. Wintle, of Futtiegurl, dated 6th June—"Regarding the potato [from Melbourne stock] you sent me"—observes Colonel Wintle—"I am afraid I must say they proved a failure with me. I sowed some whole and some cut up; the produce was not satisfactory in size or quantity. Out of the 11 seers put in I only got $\frac{9}{10}$ seers. I have kept them for seed, they are all sprouting and shall put them in again in October, and perhaps the yield will be better."

The finest and best crop of potatos I ever had, was from a packet of potato seed I had out from Sutton & Co.'s I sowed the seed broadcast, the produce was small potato of the size of marbles weighing all about 14 seers. I kept these and the following cold weather put them in, and the yield was, as I may say, the finest and best crop I ever had weighing, I should say, about 12 maunds. The price of the packet of seed was 6 pence."

The Secretary intimated he had requested Messrs. Sutton to send a few packets of the same seed for distribution to Members' desirous of trying it.

MODE OF GROWING ANÆTOCHILI.

Mr. J. Coles Hardinge, the Honorary Secretary of the Agri-Horticultural Society of British Burmah, submits a mode of treating the Anætochili, which he has found very successful.

COMMUNICATIONS ON VARIOUS SUBJECTS.

1. From H. Beveridge, Esq., c. s., Bankipore, states, with reference to the memorandum on Munjeet in the last Number of the Society's Journal, that it is cultivated in certain parts of the Buckergunge district.
2. From the Collector of Backergunge giving some particulars on the cultivation of Munjeet in his district.
3. From Captain J. F. Pogson, a note regarding *Gossypium arboreum*.
4. From Under-Secretary, Government of Bengal, further particulars regarding *Sida rhomboidea*, in continuation of the papers submitted at the March Meeting.
5. From the Secretary, notices regarding the flowering of Bamboos.

6. From Captain Pogson, particulars regarding the identification of wild strawberries in connection with recent papers respecting the efficacy of *Potentilla* leaves for cattle disease.

The above papers were transferred for publication in the Journal.

7. From the Deputy Commissioner of Sumbulpore, applying for seed of the Manilla hemp plant.

8. From the Secretary Agri-Horticultural Society of Lahore to the same effect, and information as to mode of cultivation. (Information given, but plants not available.)

9. From the Executive Engineer, Cuttack, applying for information regarding culture of the Date tree, cost, yield of Sugar, &c. as he thinks it might be profitably cultivated in the Canal lands and banks of the Orissa district. (Complied with.)

10. From Messrs. Andrew Yule & Co., applying for information regarding the culture of the Maple at Darjeeling in connection with a large supply of seed recently received by them from America through the intervention of the Society. (Complied with.)

Thursday, the 21st July, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Messrs. A. W. Hurle, J. E. Weingartuer, C. Hudson; the District Engineer of Jessoro; the Manager of the Rungting Tea Company; Baboos Rakhal Doss Holdar and Amrita Narain Acharjea Chowdry, and Captain W. H. M. Francklyn.

The names of the following Gentlemen were submitted for Membership:—

The Rev. Albert Williams, Scrampore,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Edward Delius, Esq., Calcutta,—proposed by Mr. W. H. Cogswell, seconded by Mr. J. G. Meugens.

W. MacNab, Esq., Tea Planter, Hatibanda, Nowgong,—proposed by Mr. G. L. Kemp, seconded by Mr. S. H. Robinson.

Augustus Bauermeister, Esq., Merchant, Saigon *via* Singapore,—proposed by the Secretary, seconded by Mr. H. A. Firth.

Manager of the Meleng Tea Estate, Assam,—proposed by Mr. A. B. Inglis, seconded by Mr. D. Cruickshank.

W. D. Pratt, Esq., District Superintendent of Police, Midnapore,—proposed by Mr. H. Cornell, seconded by Mr. W. & C. Beadon.

Baboo Rammnarain Chatterjee, Calcutta,—proposed by Baboo P. C. Mittra, seconded by Baboo P. C. Ghosa.

Retained—Manager, New Gola Ghaut Company, Assam.

CONTRIBUTIONS.

1. Report on the Botanical Garden of South Australia for 1880. Presented by the Director, Dr. R. Schomburgk.
2. Memoirs of the Geological Survey of India, Vol. 18, Part I. From the Director.
3. The Indian Forester, Vol. 7, No. 1. From the Editor.
4. Proceedings of the Asiatic Society of Bengal for May, 1881. From the Society.
5. A seedling of *Amherstia nobilis*. From Major R. H. Fanshawe.
6. Seeds of *Musa Ensete*. From Dr. G. Schwenfurth.
7. Four kinds of Tobacco seeds. From the Director, Department of Agriculture, N. W. P.

GARDEN.

The Superintendent's Monthly Report was read, of which the following are extracts:—

"Propagation work, both ornamental and chard, is being pushed on vigorously. I would beg to suggest that for the clearance of stock that is accumulating a general reduction of 25 per cent. in price of all classes of plants be made to Members. I feel certain that it is practicable to reduce the same 50, and in some instances 75 per cent. after the rains; but to enable the Garden to do so, I would point out to Members that their co-operation is necessary in applying for their allowance of plants promptly. Plants propagated during the rains have to be kept confined in pots to meet indents from Members, who, in many instances, fail to send for their allowance when due. The plants thus imprisoned for a long time in pots, when they should be in the earth making growth and gathering strength, naturally suffer, and when deferred till after the following rainy season, they must suffer from rot, earth-worms and the many other vicissitudes of plant life. The delay in claiming allowance of plants also increases the work of the garden hands, when they would, under the conditions suggested, be engaged in other work, tending to the interests of Members."

If this suggestion is acted upon, and an increase in the number of Members thereby obtained, it will be possible, I have no doubt, to make further reductions in prices, and enable the Society to import plants under special arrangements, and supplied to Members at such easy terms that will do away with any monopoly that there may be.

I have known as much as one hundred rupees paid for a plant, which, under such circumstances as the Society could arrange, should not have cost more than ten rupees at the outside.

As the specimen Coffee plants in the garden are now fruiting, parties interested in their cultivation will have an opportunity of satisfying themselves by personal observation, that the Arabian is the plant for Bengal. The Arabian is bending with its load of berries. The Liberian is almost bare. This latter

plant may be of good foliage, and that is all that can be said of it, as respects Lower Bengal."

The suggestions in the above report were favorably received by the Meeting. It was also thought desirable to notify to Members, not desirous of receiving their annual supplies of vegetable and flower seeds, that they could obtain a double share of ornamental plants in place thereof.

In reference to the above notice about Coffee from Arabian stock, the Secretary alluded to a remark in a recent issue of the *Englishman*, that the crop is said to be a fair average one in the Chittagong Hill Tracts. He further drew attention to the opinion given by a Committee of the Society, so long ago as 1843, on Coffee raised in that district. An attempt was made about that time to form a Joint Stock Company for the cultivation of the plant in that locality, but it was not carried out. In respect to Coffee cultivation in Ceylon, a correspondent, in a recent issue of the *Gardener's Chronicle*, adds the following remarks in an account of that island and its capabilities:—

"Of Liberian Coffee, I need say but little. It is now being largely planted in the hotter parts of the island, and is a strong and rapid grower, suffering but little from leaf-disease. It ripens its fruit at irregular seasons, and requires less care in pruning and cultivation, but does not seem to be thought much of in the London market, though in America it sells well. From what I heard I doubt its ever taking the place of ordinary Coffee, which, notwithstanding all losses, is still one of the most valuable crops that can be grown."

DEVELOPMENT AND IMPROVEMENT OF THE FUTURE WOOL TRADE OF INDIA BY THE INTRODUCTION OF LONG WOOLLED SHEEP FROM SOUTH AMERICA.

The following communication from Captain J. F. Pogson on the above subject was next submitted:—

The people of Beloochistan and adjacent parts of Afghanistan, derive a very handsome and annual income from the sale of wool to British Merchants resident at Kurrachee, the natural sea port of the Punjab and through it of all Afghanistan.

The wool at present produced in the Punjab is of inferior quality, but if Rams and Ewes of superior breeds were to be introduced from a part of America possessing a warm climate, improvement would at once take place, and an opening and employment be secured for the rising generation of Europeans.

I will show presently that the Punjab is destined to be a great wool-producing country, that is if the Home authorities do not extinguish the production by placing obstructions in the way of the European Proprietor or Gentleman Sheep Farmer.

The Salt Range of the Punjab is remarkable for possessing a breed of wild sheep, and it follows that where the wild sheep thrives, the proper breed of domesticated sheep will do the same, and further that the cross breed

between the two will produce a hardy long woolled sheep of very considerable value to the Sheep Farmer. In the rains the various breeds (seven in number) of sheep, the produce of imported stock, would be driven up to graze in suitable parts of the Salt Range, and I presume the localities would be selected as Farm Stations in the winter, or after the rains the sheep would be sent to graze in the plains, where shearing operations would take place, and the pressed and packed wool be sent down the Indus and Jhelum Rivers to Mooltan, whence water carriage by steamers and cargo flats to Kurrachee would be available or, if preferred, the Indus Valley Railway could be resorted to.

To carry out the project, I would suggest the formation of a Joint Stock Company with sufficient Capital to Import 20 Rams and 100 Ewes of each of the seven breeds described beneath.

The Government of India as well as that of the Punjab, would, I think, feel disposed to encourage such an undertaking, and the former might sanction grants of grazing land being allotted to the Company on the most favorable terms.

With this introduction, I beg to invite the attention of the Council of the Agricultural Society of India to the extracts which are subjoined, and have been taken from the columns of the *Delhi Gazette* of the 8th August, 1879, in which part of the Journal kept by Mr. Paul, Civil Engineer, employed by the Bogota Government, was published.

BOGOTA, is the Capital of the United States of COLOMBIA, South America, and the difficulties of transit alluded to having been removed since 1873, the importation of sheep could be very easily carried out by private enterprise, having the sanction and support of the Home and Indian Governments.

Extracts from Journal—

"TUESDAY, April 8th, 1873.—Javoncillo to San Vicente.

About wool. Owing to the difficulties and expense of transport the price of wool is very high, and therefore does not figure in the list of exports; but with the opening of a line of railway bringing the coast into quicker and cheaper communication with the interior, it would become one of the chief exports of the country, and in such an event Sogamuso would become an important centre for wool.

The following are some of the principal breeds of sheep of the country, viz :—

Oveja (sheep) de chircate. Is small, the meat is bad, wool coarse but strong, is not subject to disease. Its fecundity is great, the fibre of the wool is about thirteen inches in length. It is very hardy, thrives in poor and exposed situations. The wool is used in the manufacture of matrasses, coarse blankets, &c. The price ranges between £5 and £8 per 100 lbs. without being washed. This species is used principally for its wool.

Common sheep, *Oveja comun.* The ordinary Spanish species, but fed on good pastures and in a temperate climate. Is large, meat savory, wool short

but very fine, it is used in the manufacture of cloths for trousers, fine blankets, baize, and woollen stuffs generally for out-door and in-door wear. Its price varies from £2-11-4 to £4 per 100 lbs. This species is reared principally for its meat.

Oveja Cari-pintoda. Black or speckled-headed. Is larger, and the quality of the meat better than the previous one, but its wool is not so fine. It is reared in the state of Bozaka.

Oveja Merina (Merino)—Was introduced into the country in 1825. It flourishes in the States of Boyaca, Cundinamarca, and at Concepcion in Salitander. Though the original stock has been so mixed with other kinds of sheep still the fineness of the wool has not degenerated, but nearly retains its original characteristics.

Oveja Dishley. Notwithstanding several crossings with inferior breeds this species has lost none of its original qualities; on the contrary the wool has become slightly finer and longer. The best breed is to be found in the neighbourhood of Tunja, Estate of Boyaca, which produces very beautiful, soft and fine wool, about a foot in length.

Oveja Nankin. Introduced into the country about the year 1869 from China. It is small, but is distinguished for its wonderful fecundity, the savouriness of its flesh; its wool resembling merino, colour bright yellow, soft, and quite equal to the indigenous species.

Ovejada Tierras Calientes. Very large, flesh delicious, fleece coarse and strong, staple from 6 to 8 inches in length. It abounds in the valley of the Magdalena whence it can be easily and cheaply exported, and it can be raised on pastures quite unfitted for the rearing of cattle. Many millions of this description of sheep could be raised on the *Llanuras* of Tobina, and on the banks of the Rivers Cesar and Magdalena. Some few Leicestershire sheep have been imported, and the result of their crossing with these indigenous to the country has been satisfactory.

Maize and sugarcane are now being weeded: the instrument wherewith the operation is performed is of the shape of an English hoe but larger yet not quite so large as the *phaora* or *kodali* of India."

I have quoted the last paragraph to show that the soil and climate is somewhat akin to that of parts of India, and as the Mangoe, Guava, and Plantain flourished, and ripen fruit, the imported breeds of sheep should thrive.

It would be easy to obtain seeds of the best description of grasses indigenous to COLOMBIA, and their systematic cultivation and extension in the Punjab would very speedily convert large tracts of waste lands into valuable pasturages.

The natives of the Punjab perfectly understand sheep farming and goat breeding, hence trained men in numbers would be available as Shepherds, and if Government annually imported 100 of the "*Bright yellow wooled*" breed

of sheep for distribution, the “*Golden Fleece*” of the Punjab, when woven, would be highly prized by all classes and greatly enrich the Native Sheep Farmers.

Letters were submitted—

1. From the Secretary, Government of Bengal, in continuation of former correspondence on the subject of Manilla hemp, and intimating that some shoots thereof will be transferred for the Society’s Garden on their receipt from the Andamans.
2. From Captain J. F. Pogson, suggestions as to the cultivation of *Sorghum saccharatum*.
3. From the Secretary, notice regarding Cochineal.
4. From the same, remarks on Sugarcane *quoad* its propagation from seed.
5. From the Secretary, Agricultural Society of Bijnour, a memorandum on the improvement of Agriculture in the Bijnour District.

The above were transferred for the Journal.

Thursday, the 25th August, 1881.

RAJAH SUTTYANUND GHOSAL BAHADOOR, *in the Chair.*

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members :—

The Rev. Albert Williams, Messrs. E. Delius, W. MacNab, A. Bauermeister, and W. D. Pratt, Manager of the Meleng Tea Estate, Assam, and Baboo Ramnarain Chatterjee.

The names of the following Gentlemen were submitted for Membership :—

The Superintendent of the Chumba State, *vid* Dalhousie,—proposed by the Secretary, seconded by Mr. A. Wilson.

H. Farrer, Esq., c. s., Serajgunge,—proposed by Mr. S. Gowan, seconded by Mr. H. A. Firth.

F. W. Tytler, Esq., Superintendent, Railway Mail Service, Allahabad,—proposed by the Secretary, seconded by Mr. R. Blechynden.

C. A. N. Wallich, Esq., Tea Planter, Julpigoree,—proposed by Mr. G. W. Shillingford, seconded by the Secretary.

Captain T. A. Freeman, 70th Regiment, N. I., Subathoo,—proposed by the Secretary, seconded by Mr. G. L. Kemp.

Dr. C. N. Kerton, Calcutta,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Rejoined—Maxwell Smith, Esq., Tirhoot.

CONTRIBUTIONS.

1. Review of the Forest Administration for 1879-80, by the Inspector-General of Forests. From the Government of India.

2. On the manufacture of Iron and the future of the Charcoal Industry in India. From the Government of India.
3. Annual Report of the Smithsonian Institution for 1879. From the Institution.
4. Journal of the Asiatic Society of Bengal. Parts 1 and 2 of No. 2, 1881, and Proceedings for June and July. From the Society.
5. A quantity of Orchids from the Dooars. From B. H. Carew, Esq.
6. A collection of Orchids from Sylhet. From C. K. Hudson, Esq.
7. A quantity of seed of the Carob (*Ceratonia siliqua*). From the Director, Department of Agriculture, N. W. P.
8. A small supply of Potato seed of three kinds. From Messrs. Sutton and Sons.
9. Some acclimatized Aster seed. From C. Nickels, Esq.

GARDEN.

A report from the Garden Committee was submitted. The Committee allude to the economic portion of the garden, and to the increased amount of propagation in the Orchard. They refer to the plan for the proposed Plant House; to the steps taken for introduction of a large collection of plants from England and Australia; and to the distribution of plants in future annually to Members, instead of in arrears of two or three years, which has not been found to work satisfactorily. The Committee add in conclusion that—"The garden is altogether in as clean a state as can be expected at this season, and the tanks, especially the western one, fuller than usual at this time of the year, in consequence of the drainage scheme of the Superintendent having worked well. As there are yet two months of the rains remaining there is not likely to be a scarcity of water in the next dry season."

PARTICULARS REGARDING FRUITS, THE PRODUCE OF KUMAON.

Read the following letter from Mr. W. Lee, of Messrs. Wheeler Brothers, dated Ramgurh and Julna Tea and Fruit Estates, in Kumaon, 6th August:—

On reading an account of the proceedings of the Agri-Horticultural Society at their General Monthly Meeting held at Calcutta, on the 23rd June, 1881, as reported in the *Pioneer* newspaper of the 6th July, we particularly noticed the remarks which referred to a "Trial shipment of fruit from Melbourne," and it seemed strange to us that with some of the very finest varieties of English fruit procurable in India, or indeed in any part of the world, within comparatively easy distance from Calcutta, that a trial should not also be accorded to a consignment of the fruit which is produced in our Gardens and Orchards here.

We would briefly point out that the Ramgurh and Julna Fruit Gardens and Orchards were commenced as far back as 1858, since which period annual

importations of the choicest fruit grafts from England and America have been made, the result being that at the present time the above Gardens and Orchards are fully stocked with the finest varieties of fruit grown in Europe.

Experience extending over a period of 20 years has amply proved that the temperate climate of the Himalayas is most perfectly adapted for the successful culture of apples and pears, both of which fruits are here produced of far superior size and flavour to similar varieties grown in the cold and damp climate of Great Britain.

We are still increasing our Gardens and Orchards largely, and we now already raise quite a sufficient quantity of fruit to supply the Calcutta market to a considerable extent. The crop of apples alone on both Estates, viz., Ramgurh and Julna, averages about 50,000 per annum now, which will undoubtedly increase yearly as the succession of newly planted trees come into bearing; and our crops of pears may also now be estimated in the same ratio as the apples, and these will also in like manner increase.

As seeing is believing, we would suggest that we be permitted to forward a small case of apples for inspection to you, which we should be glad if you would submit for the approval or otherwise of the President and Committee of the Agri-Horticultural Society.

The first sample case which we would propose to send from here would be of cooking apples such as are suitable for pies, puddings, dumplings and baking, and we would follow them up by sending samples of our eating dessert apples, which latter would no doubt bear the journey in perfect condition, and we could supply them regularly from August to the end of October. The cooking apples, some of which are very large and are now ready, would be those about which most difficulty might be apprehended as to their reaching Calcutta in perfect condition. The dessert apple, would not be so liable to suffer.

The journey from here to Calcutta, should from first to last occupy no more than a week, i. e. from the time the fruit be plucked from our Orchards to the time of its reaching Calcutta, and would as soon as the projected Kumaon and Rohilkund Railway from Bareilly to the foot of the Hills is opened, occupy but four or five days.

We have hitherto found a local market for our fruits in Nynee Tal, and have sent small quantities for sale to Simla, Lucknow, Cawnpore, Meerut, Mussoorie and even as far as Gwalior, and we have found that in most cases our fruits have reached their destination in good and fresh condition, and have been highly appreciated.

If our fruits, upon inspection and trial by the President and Committee of the Agri-Horticultural Society, be found to be such as we represent them to be, and to be worth sending to Calcutta, we should be prepared to forward a large number in the latter part of September and in October to any Firm in Calcutta who would kindly accept the Agency for their disposal.

In conclusion we would beg that our letter and proposal be laid before the President and Committee of the Agri-Horticultural Society, and that a report be made on the subject, and also on the quality and condition of the samples of fruits which we would send at the next General Meeting of the Society.

On receipt of your reply we would at once, at our sole expense of course, forward to you a sample or samples of our apples. The pears will be ripe shortly in this month (August).

The enclosed notice will shew you the rates at which we have hitherto sold our fruits to purchasers in the plains, the fruits being delivered at Bareilly, which is our nearest Railway Station, at our expense, but in sending large consignments to Calcutta, we could no doubt be able to deliver them there at the same rates, provided the demand was such that the fruit could be disposed of rapidly, as the climate of Calcutta will not admit of their being stored for any length of time, especially during the months of August and September.

Read also a letter of subsequent date, (20th August,) from Messrs. Wheeler Brothers from their Julna Estate :—

On the 6th instant, our partner, Mr. William Lee, addressed you from the Ramgurh Tea Estate, regarding the superb apples and pears annually produced in our extensive Orchards, and he suggested sending you samples to be placed before the Committee and duly reported upon. Your reply of the 13th August has been sent to us here, and Mr. Lee further writes to say that he has despatched a case containing samples of apples, pears, some filberts produced at our Ramgurh Estate, and which, we hope, will reach you by the 25th to be in time for your Monthly General Meeting. As we have a larger variety of apples in our Julna Orchards, we beg to advise having despatched by this day's parcel post a small box containing upwards of 40 different sorts of apples, and we feel confident that a more varied or finer collection of fruit has rarely if ever been witnessed in Calcutta. We shall be much obliged by your submitting the samples sent by Mr. Lee, from Ramgurh, and those advised by us, for the approval or otherwise of the Committee at the same time ; and as our object in sending the samples is to establish the superior quality of our fruits in the Calcutta market, we hope the opinions of the several Members of the Committee will be fully recorded and published in the Proceedings of the Society. Among the samples sent by us we may here mention that Nos. 3, 8 and 14 are Ribstone Pippins, Nos. 5 and 10, are the Baldwin, an apple largely exported from America to the Calcutta market, No. 7, is the celebrated Fall Pippin or white Spanish Renette, No. 9, the equally well-known Renette du Canada, No. 17, Adams' Pearmain, No. 13, Braddicks Nonpareil, No. 22, Pine Golden Pippin, No. 26, Boston Russet, No. 23, the Dutch Mignon ; and we have also sent half a dozen genuine Golden Pippins and the same number of Pommed Api or the little Lady Apple. If you could kindly arrange to allow the influential residents of the city to examine our samples we should be very thankful.

This collection of fruits was highly thought of by the Members present, the best ever shewn, as the produce of British India. Messrs. Wheeler Brothers add that "they have not been selected on account of their size and appearance as specimens, but represent a fair average of our fruits; as far as apples and filberts are concerned. We have thousands of larger apples at this moment in our Orchards. The very few pears we have sent are of our smaller variety, our pears are not yet ripe, and of these we have very fine specimens which will be fit to pluck in about three weeks."

BARLEY RAISED IN THE HIMALAYAS.

Submitted a letter from Captain J. F. Pogson, dated Koteghur, 18th July, of which the following is extract:—

"I have by this-day's bangly post sent you two ounces of "*Wheat Barley*," and inspection will show that there are two distinct kinds, one being of the variety raised at Mirzapore by Mr. Nicholson from seed given to one of his servants, and the other being so very like *wheat* in colour and form, as to deserve its name of "*Wheat Barley*."

The Zemindars of Koteghur have grown this Barley, *i.e.* like the sample sent, from ancient times, and although this place may not be the home of these two varieties of Barley, it has become as common as the other or husked kind, with which it is sown, as I have had to pick out the husked kind.

Thibet may be the home of both kinds, and a traveller from Nepaul may have brought the Barley, (Mr. Nicholson's variety,) with him to Benares, which is much visited by Pilgrims from Nepaul. If this surmise be correct, both varieties of Barley should be obtainable in the Bazars of Katmandoo, and their introduction into the plains of Hindoostan, under Government sanction and support, becomes a very easy and simple affair.

At Koteghur, the present price of the Wheat Barleys (mixed,) is sixteen seers per Rupee, and if the husked kind be picked out, the cost of labor, and reduction in quantity may bring it down to 10 or 12 seers per rupee.

If Nepaul cannot, or *may not*, supply the seed, I shall be happy to execute all orders sent through the Society. Officials or Collectors of Districts, could have their indents executed through Major Parry Nisbett, the Deputy Commissioner of Simla, or if they preferred it, I would do the needful.

According to "Ures Dictionary":—"The weight of the husk of Barley is one-sixth the weight of the grain" or in simpler language six maunds of English Barley, contain one maund of *husk*. Now, as the husk has no nutritive value, it must be admitted that, the price being the same, the purchaser of six maunds of "*Wheat Barley*," obtains one maund, or 82 lbs. more of food for his money, than does the purchaser, of six maunds of the common Barley, or to put it in rupees, a saving of one in six results from the use of the "*Wheat Barley*." Good Barley contains two-and-a-half per cent, of "Phosphate

of Lime," the principal component of all *Bones*. Indian bred horses and ponies, are deficient in bone, as compared with the Arab horse, Burma pony, and Thibet pony, all being fed chiefly on Barley. The Indian horse gets Barley and gram mixed, but preferably only gram. The result is the high price of gram. Now if the Government fostered the cultivation of "*Wheat Barley*," two valuable results would follow, the first being the improvement in bone, of all horses, bred and raised for the mounted branch of the Army, and the second a very considerable saving in the cost of horse food.

The Zemindars, or Agriculturists interests may now be considered—First, all unsold "*Wheat Barley*," excepting that required for seed, would be available for food—2nd, the corresponding quantity of wheat would be placed in the market for export to London—3rd, a considerable quantity of gram now consumed by horses, would be sent to Europe, and as this might be "*white gram*," the Zemindar would realize the difference in money value, which would not be insignificant—4th, with this *Wheat Barley* to hand, European Distillers could produce very large quantities of Extra Superior Whiskey and a glass of Hot Whiskey Punch, would come within the means of the ryot in place of the poisonous "*Mudrak*," of the Kullaul. Finally the Excise would be a gainer, and Rs. 24 per dozen and upwards would cease to be paid for imported Scotch and Irish Whiskey, whilst an Export Trade in Indian Whiskey would be called into existence, and become permanent."

PINUS LONGIFOLIA.

The Secretary mentioned that he had distributed largely the seed of *Pinus longifolia*, received in June last, from the Superintendent of the Botanic Garden, Saharunpore, and that there was still a good quantity in hand, for which he would suggest early application. This tree, it would be remembered, was brought to the notice of the Society by a Member (Dr. Geo. Henderson) in the early part of the year (*see* proceedings for February) as well worthy of cultivation whether for shade, ornament, fuel or timber. A list of parties to whom the seed had been distributed was placed on the table, including Managers of Tea Gardens and others in various parts of the country.

Letters were submitted—

1. From Secretary, Government of Bengal, on the subject of certain models of Agricultural Appliances from China, Japan and the Philippine Islands.
2. From Baboo Mohesh Chunder Bose, Berhampore, forwarding two instruments to add to the collection of Agricultural Appliances, one of iron and another of silver, used for making incision in poppy pods.
3. From the Under-Secretary, Government of India, Agricultural Department, forwarding copy of a correspondence regarding the cultivation of *Reana luxurians* in the Punjab.
4. From the Secretary, Agricultural Institute, Bijnore, returning thanks for supplies of seeds.

5. From the Deputy Commissioner, Peshawur District, stating in reply to enquiry, that the white gram alluded to in recent proceedings is cultivated in the Logar Valley and the country generally round Cabul. It is sown in March and ripens in July and August.

6. From the Assistant Commissioner, Hurdui, Oude, applying for some of Captain Pogson's seed barley, alluded to in the proceedings for June. Mr. Naher writes—"I am in charge of the Public Gardens, and we are just now trenching some land according to the wishes of the Commissioner, a portion of which has been turned up by experimental plough, in which I should like much to try this barley also in the garden. I see you have been discussing the white gram. I have grown it for several years; but always found both at this place and Per-tabghur that it required irrigation to bring the grains to their proper size."

Thursday, the 22nd September, 1881.

S. H. ROBINSON, Esq., *V. P., in the Chair.*

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members :—

The Superintendent of the Chunba State, Messrs. H. Farrer, c. s., F. W. Tytler, C. A. N. Wallich, Captain T. A. Freeman and Dr. C. N. Kerton.

The names of the following gentlemen were submitted for Membership :—

The Rajah of Bood, Cuttack,—proposed by Baboo P. C. Mittra, seconded by Baboo Joykissen Mookerjee.

Major W. Dalrymple, Cantonment Magistrate, Neemuch,—proposed by the Secretary, seconded by Mr. J. E. MacLachlan.

C. Y. Downing, Esq., Zemindar,—proposed by Mr. R. S. Pyne, seconded by the Secretary.

CONTRIBUTIONS.

1. Annual Statement of Sea-borne trade and navigation of the Bengal Presidency for 1880-81. Report of the Police of the Lower Provinces for 1880. Records of the Geological Survey of India, Vol. 14, Part 3, 1881, and Annual Report of the Royal Botanic Garden, Calcutta, for 1880-81. From the Government of Bengal.

2. Memoirs of the Geological Survey of India, Vol. 18, Part 3. From the Director.

3. Journal of the North China Branch of the Royal Asiatic Society, new series, Nos. 11 and 13. From the Society.

4. Plants of *Brownea ariza* and seed of *Pithecolobium saman*. From the Superintendent, Royal Botanic Garden.

5. A small collection of Orchids from Singapore. From E. Kock, Esq.

GARDEN.

A report from the Superintendent was read, of which the following are extracts :—

"Annexed is a detail report on plants recently imported from England per Mr. William Bull.

The garden has been considerably thinned of large and small trees as there are several other specimens, and the effect is better light and ventilation; several other large and useless trees will be shortly cut down.

Trial germination of vegetable seeds per Sutton, (English) and Buist (American) has been successful, all having germinated freely, the young plants look vigorous and healthy; a detail statement will be submitted in next month's report along with that of flower seeds when tested.

Both tanks are well supplied with water.

Angling.—Both tanks are well stocked with fish.

The garden can now issue *Musa uranoscopos* under English cost prices, and the following is description of the plant. This new Queensland Banana will form a noble ornament for a warm conservatory, it has a thick handsome stem formed, as in its allies, by the sheathing leaf stalks, which support large broad leaves not unlike those of *Musa ensete*. The flowers and fruits are borne in erect racemes, unlike those of the ordinary Banana, in which they are nodding—will flourish in the open in India.

Ficus diversifolia—See the *Gardener's Chronicle* of 20th ultimo, page 247, figure 52. The garden has a small number of these plants ready for issue.

Members are advised that the garden is having accessions of plants daily, and as the same are in constant issue, it would be impossible with any degree of accuracy to keep altering the catalogue, but by watching the proceedings, Members can make out their requisitions accordingly. Orchids are not enumerated in the catalogue as their value is averaged with cost of collecting, exchange, &c., and therefore fluctuate; but I can confidently say from what I have learned from Members and others, whom I have supplied with these interesting plants, that the cost is astonishingly low. The garden stock of Orchids from Nepal, Shillong, Kossia Hills, Singapore, Burmah, Borneo, the Andamans and other places is extensive. Orchids from America and Australia are very expensive, and do not seem to thrive in India, so the cultivation of these plants is not continued in this Institution, as they only entail disappointment.

This report would be too lengthy if I were to enter into a very full detail of our plants, but at the present moment, I may say, it is rich in such plants as will thrive in the country with ordinary care."

A recommendation was submitted from the Council that Members be allowed to have fruit grafts to the value of Rs. 20 annually according to catalogue rates, should they prefer them to ornamental plants. This rule to be tried for one year. Agreed to.

POTATOS.

Read a letter from Messrs. Wheeler Brothers and Lee of Ramgurh Estate, *viz* Nynce Tal, acknowledging receipt of a small quantity of Japan potatos which were placed at the disposal of the Society by Mr. H. A. Firth with the view of trying them at Nynce Tal. Messrs. Wheeler Brothers remark that "the season has now passed for planting them, but we incline to think that they will do very well here, as we raise some splendid potatos on this Estate, though we have not hitherto given a trial to the variety which you have sent. We will store those which you have sent us with our own seed potatos this winter, and will carefully sow them in the spring, in a plot by themselves, and send you a report as to the result."

As bearing on the same subject a letter was read from Messrs. Lloyd and Co., respecting the consignment (32 mounds) of Melbourne potatos received in February last, and alluded to in the proceedings of that month. "We can now"—observe Messrs. Lloyd and Co.—"give you the information you asked for regarding the Australian potatos." The person to whom we sent them up to in Darjeeling, reports on them, as follows:—"The Australians turned out badly. Nearly all were rotten as Mr. Leitch saw. All the pieces I thought good "I planted at Helensburgh except about 30 I planted above the Hotel, these "latter all rotted. At Helensburgh 1 in 40 came up, and of these the slugs "eat several away at the root. Several rotted and had insects eating in them. "I tried three boiling when they were new. They were not very tasty, i. e. "not good flavour. The remainder consists of about 3 mds. of small potatos "which I think of setting in the Terai, unless you want them elsewhere."

TUBERS OF "CHUFFA," *CYPERUS ESCULENTUS*.

The Secretary placed on the table some tubers of the above grass, recently received in response to his application, from the Director of the Botanic Garden, Adelaide, who thus writes respecting it in a recent report:—"Chuffa or Earth Almond. The American papers praise it, and say that for a few years after its introduction nothing was heard of it, except here and there as a curiosity; but within the past year or two the interest in the plant has revived, and the Southern papers are advocating its culture. It is said that an acre of chuffas will produce more pork than an acre of corn. The yield is said to be about 200 bushels to the acre. It is also still extensively grown in modern Egypt. The Chuffa dies down during winter. It is planted in rows two and a half feet apart, and two tubers should be planted two feet apart, and two inches deep. It does not seem to do so well with us as in America."

It is also alluded to by Dr. Royle in his *Himalayan Botany* as follows:—"The aromatic principle being absent in the tubers of some species, while fecula is secreted in larger proportion, they are employed as food, as those of *Cyperus esculentus*, a native of the South of Europe, and of the North of Africa, and

supposed to be the Malinothalle of Theophrastus. In addition to fecula these roots contain a fixed oil, which enables them to be formed into palatable emulsions, which with the addition of sugar, have been employed as a substitute for coffee and cocoa."

The Secretary added he had also applied to Dr. Schomburgk and received from him some seed of the "Egyptian Pearl Millet," which is apparently our "Bajra" (*Panicum spicatum*.) A portion of the chufa tubers had been sown in the Society's garden; the remainder (a very small quantity) is now available to Members.

JAPAN PEA.

Read a letter from Captain J. F. Pogson, forwarding an extract from an American paper (*Mississippi Patron*) respecting a prolific pea raised in Japan, and suggesting that steps be taken towards obtaining a quantity of this variety for trial in India, which was agreed to.

The following is the extract alluded to:—

"Mr. T. E. Martin, and Mr. R. T. Rutledge, both American progressive farmers, state that the "Japan Pea" is the most productive, as well as good food that they have ever grown for all kinds of stock; horses, cattle, sheep, and hogs, will eat the peas, stems, and leaves if harvested before fully matured and cured like other hay, with as much relish as they do corn. Then there is no Pea for the table, it is soaked in water the night before cooking, that has a more exquisite flavor. They grow on a stout bushy stalk from two to three feet high, somewhat resembling the cotton plant. The main stalk, as well as the branches of the limbs, are literally loaded with small peapods, filled with little yellow peas, similar in colour, size, and flavor to the English garden pea."

As regards cultivation, they state:—"But the way to get the greatest yield is to plant in hills two and-a-half feet each way, allowing but one stalk to the hill, to remain after the first working. That will give you 6,960 stalks to the acre, and on ordinary land, cultivated the same as corn, will average at the lowest estimate a pint of shelled peas to the stalk, or a fraction over 108 $\frac{1}{2}$ bushels per acre. I doubt not that with high cultivation, and good soil, it would be an easy matter to double that yield, besides there is no other crop that will yield more hay to the acre. In fact I know of no crop so remunerative as the Japan Pea. It is a sure cropper, as clearly demonstrated by my experience with this season's crop. Neither wet nor dry weather materially interferes with the quantity or quality of the yield."

BAEL FRUIT.

Mr. R. A. Sterndale submitted an extraordinary cluster of Bael Fruit, nine in number, with the following particulars:—

"Baboo Hem Chunder Mookerjee, of Jonai, a well-known Zemindar of these parts, has just brought me the accompanying very curious cluster of Bacl Fruit which I send over to the Society as a rarity.

The bunch consisted originally of ten Baels, but one got knocked off. On the same tree but almost out of reach is a similar bunch but larger. Baels as a rule, grow single or occasionally in pairs. I have never seen a cluster like this before, it resembles a bunch of gigantic green grapes."

Letters were read—

1. From Deputy Assistant Commissary General, applying for a pound of tobacco seed for cultivation in the Andamans. Complied with and results of sowing promised in due course.
2. From Under-Secretary Government of India, Revenue and Agricultural Department, requesting that in future a copy of the Journal be sent to the Department.
3. From Dr. Gustav Oppert, applying for publications of the Society in exchange for the Madras Journal of Literature and Science.
4. From the Librarian, North China Branch of the Royal Asiatic Society, forwarding certain Numbers of their Journal and requesting an interchange of Publications. Agreed to.

Thursday, the 27th October, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members :—

The Rajah of Bood, Cuttack, Major W. Dalrymple and Mr. C. Y. Downing.

The names of the following gentlemen were submitted for Membership :—

Col. Hicks, M. S. C., Deputy Inspector-General, Police, Waltair,—proposed by Mr. H. G. Turner, M. C. S., seconded by the President.

T. C. Hill, Esq., Superintendent of Telegraphs, British Burmah Division, Rangoon,—proposed by Mr. W. Palmer, seconded by the Secretary.

Alex. Whyte, Esq., Junior, Ranecungunge,—proposed by Mr. C. Deas, seconded by Mr. G. L. Kemp.

H. J. Madge, Esq., Government Surveyor of Steam Boilers,—proposed by Mr. W. H. Cogswell, seconded by Mr. J. W. O'Keefe.

Baboo Aubinash Chunder Bauorjee, Zemindar, Bally,—proposed by Mr. W. Stalkartt, seconded by Baboo Peary Chand Mittra.

Rejoined—H. G. Turner, Esq., Madras Civil Service, Waltair.

CONTRIBUTIONS.

1. Report on the Government Gardens at Saharunpore and Mussoorie, for year ending March 1881. From the Superintendent.

2. The Madras Journal of Literature and Science for 1880. From the Editor.
3. Journal of the North China Branch of the Royal Asiatic Society, 1880. From the Society.
4. Journal of the Bombay Branch of the Royal Asiatic Society, 1881. From the Society.
5. Transactions of the Asiatic Society of Japan, Vol. 9, Part 2. From the Society.
6. A small quantity of Mahogany seed. From the Superintendent, Botanic Garden, Trinidad.
7. Five seers of wheat barley. From Captain J. F. Pogson.
8. A case of Araucaria plants. From J. A. Anderson, Esq.
9. A small assortment of flower seeds for the Society's Garden. From Messrs. Sutson and Sons.
10. Ten plants of *Musa textilis*. From the Government of Bengal.
11. Specimens of the wood of *Eucalyptus obliqua*. From Dr. Geo. Henderson.

GARDEN.

A Report from the Garden Committee was submitted and adopted, alluding to a large collection of ornamental plants recently received from Mr. W. Bull, and offering certain suggestions thereon ; and recommending a few alterations in some portions of the Garden. A large number of Mango and Litchi grafts are now available.

DIRECTIONS FOR SOWING PITHECOLOBIUM SAMAN SEED AND FOR TREATING THE YOUNG PLANTS.

The Secretary submitted the following received from Dr. King, Superintendent, Royal Botanic Garden :—

"The seeds of Pithecolobium saman should be sown at intervals of 2 inches apart on ground which has been previously dug to a depth of 12 inches.

The seeds having been sown as above, $\frac{1}{4}$ inch of soil should be sprinkled on them. No water should be added for three days, but watering should then be commenced, and be carried on sparingly for a week and subsequently freely. The seed will germinate within three weeks.

When the seedlings have grown to a height of 4 or 5 inches, they should be transplanted into beds prepared as for the seed, and so situated as to secure that the young foliage be not too much exposed to the sun. The plants should be put out at intervals of 15 inches and should be freely supplied with water. Manure is quite unnecessary at any time. The plants may remain in these beds until they attain a size suitable for putting out in the sites which they are intended permanently to occupy."

CULTURE OF THE EUCALYPTUS TREE IN THE PUNJAB.

Sundry specimens of *Eucalyptus obliqua*, forwarded by Dr. George Henderson were brought to notice, and the following communication addressed by him to the Quarter Master General in India, under date 20th September, 1881, was submitted :—

“ With reference to yours No. 2698, dated 9th July last, I had the honor to forward to you some days ago, samples of Eucalyptus Timber grown at Rawal Pindi, and I now send you the following opinions as to the value of this timber. I do this direct to save time and will forward copies of the correspondence through the usual channel. Proceedings of the Institution of Civil Engineers, Vol. 56, 1878-79. Railway Construction in Australia, page 39.

“ The sleepers are jarrah-jarrah (*Eucalyptus marginata*) imported from “ Western Australia which is believed to be one of the most valuable and “ enduring timbers in the world. It is not liable to the attacks of white ants “ if cut at proper season ; and sleepers have been taken up from some of the Rail- “ ways after lying in the ground for twelve years in as good a condition as when “ they were first laid. The sleepers are 6 feet 6 inches long, 8 inches wide and “ 4 inches deep, and sawn but not split from the log. The seat for the Rail is “ adzed by machinery on the ground.

Tredgolds Carpentry by Hurst, page 475.

“ White gum, *Eucalyptus obliqua*—This tree is chiefly to be found in Tasmania where it attains the height frequently of 150 feet with a diameter-of “ nearly eight feet at about three feet from the ground. The bark of the “ tree is perfectly white hence its name. The white gum is sometimes used “ in Ship-building ; but is especially valued for house-building and for the most “ of the purposes to which the blue gum is applied. The weight of a cubic foot “ and the transverse strength are about the same as those of the blue gum.

“ Jarrah or Australian Mahogany, *Eucalyptus (rostrata ?)* This is also one “ of the gum tree which is chiefly to be found in Western Australia where it “ grows to a height often exceeding 200 feet. The colour is much darker than “ the blue gum and very much resembles Mahogany. It is used for all the “ ordinary building purposes as well as for Hydraulic Works such as Piers, “ Jetties, &c., and for ship-building.

“ This Timber which was employed in the whaling jetty at Freemantle “ was found after sixteen years to be in as good condition as when first used.

“ It has a most valuable property that of resisting the attack of the “ seaworm and white ant which are said never to penetrate more than the outer or sap wood.”

In 1866 I sent a specimen of Eucalyptus Timber grown at Lahore to Mr. R. Boquet then Locomotive Superintendent and now Agent of the Punjab and Delhi Railway.

Mr. Boquet's report on this Timber was published by me in the Proceedings of the Agri-Horticultural Society for May, 1866, and is as follows:—

"Your specimen of the Eucalyptus would, I should say, make first rate Timber for Carriage-building purposes especially as it attains such a magnitude. The grain is particularly close and straight, and I perceive that it is buoyant "in water which oak and sal are not."

I shall feel obliged by your submitting this letter and the samples of wood to His Excellency the Commander-in-Chief.

In a demi-official letter Dr. Henderson adds—that almost all the trees he has at Rawul Pindi were reared from seed grown in India from plants sent to Abbottabad in 1865 and 1866 from Lahore.

Among the specimens is one of a goblet which Dr. Henderson remarks "was made from a tree of *Eucalyptus (obliqua?)* which was planted by me six inches in height in March 1878, and the tree was cut March 1881, being then 22 inches in girth and 36 feet high."

NEW FRUIT FROM AFRICA.

Mr. N. Bellitty sends the following extract from the proceedings of the Royal Geographical Society for July last regarding a remarkable fruit met with by Mr. Johnson while exploring in Central Africa, and which he thinks worthy of introduction into India:—

"Mr. Johnson mentions eating the *Suku* Fruit. I too ate it when we were short of food; it is about as large as a small pear; only rounder with a russet rind and three large grooved stones inside. The flesh is soft and melting more like a pear than any other European fruit. The stones each contain a small plant fully formed and with deep green leaves which bursts its shell almost immediately that the fruit falls which it always does as soon as it is ripe. It is an African custom to cut down a fruit tree to get at the fruit, so the *Suku* is wise, for if its fruit is on the tree it cannot be fit to be eaten."

Letters were read—

From P. Michea, Esq., Purneah, for tobacco seed which he is cultivating on a large scale, with an experienced Curer, and promising to communicate results. Complied with.

From the Secretary, Agri-Horticultural Society, Sydney, applying for certain good varieties of sugarcane. Compliance promised when in a position to do so.

From the Secretary, Agri-Horticultural Society of Lahore, returning thanks for seeds supplied.

From the Secretary to the Agricultural Institute, Bijnore, to the same effect.

From the Superintendent Botanical Garden, Hongkong, promising compliance as soon as possible, with request for a supply of Litchi grafts to renew garden stock.

From the Secretary, Department of Commerce and Agriculture, enquiring for the botanic name of the "Japan pea" alluded to in last month's proceedings. The Secretary mentioned he was at present unable to give this information, but had promised some of the seed when received from Japan.

Some other letters of thanks for seeds and publication and enquiries for information were submitted. For the above contributions the best thanks of the Society were accorded.

Thursday, the 24th November, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members :—

Colonel Hicks, Messrs. T. C. Hill, Alexander Whyte, Junior, H. J. Madge, and Baboo Aubinash Chunder Banorjee.

The names of the following Gentlemen were submitted for Membership :—

J. S. C. Larminie, Esq., Comillah,—proposed by Mr. W. R. Larminie, seconded by the Secretary.

A. Galios, Esq., Berhampore,—proposed by Mr. J. Perrin, seconded by Mr. G. L. Kemp.

A. H. Mackenzie, Esq., Opium Department, Cawnpore,—proposed by Mr. C. T. Castle, seconded by the Secretary.

Baboo Harachandra Roy Chowdry, Zemindar, Sherepore, Mymensing,—proposed by Baboo P. C. Ghosa, seconded by Baboo P. C. Mittra.

Rejoined—Major M. Protheroe, C. I. E., Officiating Commissioner of the Andamans.

CONTRIBUTIONS.

1. Notes on the Economic Products, N.-W. P., Part V. By E. T. Atkinson, Esq. From the Author.
2. Memoirs of the Geological Survey of India, Vol. 18, Part 2, and *Palaeontologia Indica*, Ser. XIII. From the Director.
3. Journal of the Asiatic Society of Bengal, Part 2, No. 3, 1881. From the Society.
4. The Indian Forester, Vol. 7, No. 2. From the Editor.
5. Proceedings from May to September of the Agri-Horticultural Society of Madras. From the Society.
6. Suggestions regarding the management of the Leased Forests of Busabir. By the Inspector-General of Forests. From the Government of India, Home Department.
7. A quantity of Bamboo Seed. From J. F. Duthie, Esq.

8. A small quantity of seed of *Sequoia gigantea* and *Picea grandis*. From C. Halford, Esq.

9. A quantity of acclimatized Bamieh Cotton Seed. From W. H. Cogswell, Esq.

10. A small assortment of Begonias and Ferns. From R. Dombal, Esq.

11. Cuttings of Rose plants of various kinds. From Colonel J. May.

12. Sixty Pummelo grafts, red and white varieties. From W. Stalkartt, Esq.
A special vote of thanks was accorded to Mr. Stalkartt for this acceptable donation.

Mr. Stalkartt submitted a large branch, in full flower, of *Asparagus ascendens*. It is thus described by Firminger in his *Manual of Gardening for India*. "An erect growing plant; blossoms in November, when it is most exquisitely beautiful, with its graceful sprays of minute flowers, resembling delicate plumes of silver."

Mr. J. C. DeCruze also sent a fine bouquet of Roses from his garden at Serampore.

GARDEN.

A Report from the Garden Committee was read and adopted. The Committee intimate certain repairs to the main roads in the Garden and a few other improvements.

The Superintendent's monthly report was next read, of which the following are extracts:—

Germination returns on vegetable and flower seeds received from the Society's Seedsmen attached.

Propagation of such plants as have recently been introduced to the Garden has been taken in hand.

Pothos Aurea, see *Gardener's Magazine*, 15th October, 1881, page 588 for illustration. This is a grand plant of its class and makes a very effective show with its bold cordate, creamy, and yellow blotched leaves. I would suggest that the Garden issue this plant to Members at 25 per cent. below English cost price.

There are several other matters I would wish to report on, such as alterations in the garden, donations of seeds, &c., but I have deferred the same to my next report when I may deal fully with them.

The germination returns are as follows:—

Buist's vegetable seeds, (American), all germinated, general average of 58 per cent.

Sutton's vegetable seeds, (English), Onion failed; the others germinated. General average of 55 per cent.

Sutton's flower seeds. General average of 47 per cent.

Vilmorin Andrieux's flower seeds, (French), general average of 27 per cent.

Hauge Schmidt's flower seed, (German), general average of 35 per cent.

Platz Brother's flower seeds (German), general average of 21 per cent.

TEA CULTIVATION IN THE ANDAMANS.

Read a letter from Major Protheroe, C. I. E., Officiating Commissioner of the Andamans, of which the following is an extract :—

You will be glad to hear that the Tea Experiment in Port Blair begun a few years ago, has so far been successful, and that the hybrid variety of tea, the seed of which was supplied by you from, I think, Assam, flourishes in these islands, flushes well, and the tea prepared from it has been highly valued by experts.

The China and Assam varieties of tea have not, however, succeeded so well as the hybrid.

We are now anxious to considerably extend Tea Cultivation in Port Blair, and with this object in view I should feel much obliged if you could kindly arrange to supply us with a large quantity, say 25 maunds of seed of the HYBRID variety ; shipping it to Port Blair by the earliest possible date.

The Secretary mentioned that immediate steps had been taken towards meeting the above requisition.

VEGETATION IN THE DEHRA DOON.

In a letter under date the 8th November from the Dehra Valley, Captain J. F. Pogson writes as follows :—

This is a wonderful place for Horticulture. All the large old houses have gardens and tree plantations and these, as a rule, are *Botanical Gardens*, though the Proprietors seem quite unconscious of the fact.

On Saturday, I went for a walk and stood at a gateway, astonished to behold an avenue of "keleo," trees (*Cedrus Deodara*), with "Chel." (*Pinus sylvestris*), "Kyle," *P. longifolia*, Cypress, and Juniper, (Himalayan,) in full growth in the immediate vicinity of Mangoe Trees, Plantains in full fruit, Papaya in ripening fruit, with the large bamboo, Loquat and Lichee. The Hill Blackberry growing as a weed under Jack trees (kuthul) of Bengal, and Guavas. As for forest trees with which the magnificent roads are shaded, I have yet to learn their names. What I have yet come across I do not know, for such a jumble of trees from all parts of the world, growing in defiance of all laws and notions on the subject I never expected to see.

I have come across *Ficus elastica*, American Aloe, and adjacent something very like Pineapple. Lord Hartington should come here, and imagine himself in a mighty "Chatsworth," with the cover (glass-roofing) taken off, and then perhaps the improvement of Indian Agriculture, Horticulture, and forest tree culture would be taken up in real earnest in place of being experimented upon. En route from Saharunpore, I passed through miles of forest growing as if the height of foresting consisted in seeing how many forest trees could be packed

within a given space not sufficient for the growth of half a dozen trees. Some day I will visit the forest and measure the number of trees to be found within a radius of twenty yards.

REPORT ON JUTE RAISED IN EGYPT.

The Secretary placed on the table two specimens of Jute, which had been raised in the vicinity of Cairo. The larger had been prepared by the ordinary Bengal process, and steeped in muddy water for ten days; the smaller one had been passed through Garwood's machine, previous to steeping. "The machine does no more than separate the bark from the stem, and the fresher the stem the more easily is the bark separated. The bark is macerated in the usual way, but this process, instead of occupying a fortnight or a month, as in Bengal, is completed in a few days."

Submitted a communication from Colonel C. B. Lucie Smith, Commissioner of the Chattesgarh Division, Raipore, reporting on the successful result of cultivation of *Reana luxurians* from seed furnished by the Society. (Transferred for Journal.)

For the above contributions and communications the best thanks of the Society were accorded.

Thursday, the 22nd December, 1881.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last Monthly Meeting were read and confirmed.

The following Gentlemen were elected Members:—

Messrs. J. S. C. Larminie, A. Galios, A. F. Mackenzie, and Baboo Harachundra Roy Chowdry.

Rejoined—H. Thompson, Esq., General Manager, Joyhing Tea Estates, N. Luckimpore, Upper Assam.

CONTRIBUTIONS.

1. Annual Reports of 1878 and 1879 of the Department of Agriculture of the United States. From the Commissioner of Agriculture.
2. Archives, Vols. 2 and 3, of the National Society of Rio de Janeiro. From the Director-General.
3. Note on Agricultural Improvements on the Awa Estate in 1880-81. From the Manager.
4. The "Tropical Agriculturist," Vol. 1, Nos. 6 and 7. From Messrs. A. M. and J. Ferguson.
5. Journal of the North China Branch of the Royal Asiatic Society, No. 12. From the Society.
6. Journal of the Asiatic Society of Bengal, Part 1 of 1881, Nos. 3 and 4. From the Society.

7. A Manual of the Geology of India, Part 3, Economic Geology. From the Government of India.

8. A few Mango and Peach grafts. From R. Nicholson, Esq.

9. Two Pitchers plants (*Nepenthes*) from China. From G. L. Kemp, Esq.

10. A small assortment of hyacinths and other bulbs from Mr. W. Bull.

Mr. R. B. West exhibited 12 cut flowers of Duhlias, raised from tubers from Sydney, of various colors, yellow, light and dark maroon, red and pink, the majority well quilled, and altogether a very superior assortment.

The Secretary announced the receipt of a large number of roots of the Lily of the Valley (*Convallaria Majalis*.) It was agreed to transfer these to Captain Pogson for distribution to the Moravian Mission at Kotghur and to other suitable localities. Dr. Lynch called attention to the fact that this plant has a great reputation among the people of the Caucasus in the mountains, as a remedy for intermittent fever. Has not, however, been found to succeed when experimented with by European Surgeons. Has been found successful in cases of *Angina Pectoris*. To be used in the form of an alcoholic tincture, four ounces of the flowers to the pint of dilute Alcohol. Dose, 20 to 30 drops, twice a day, or 10 drops four times a day. The powdered flowers are also used in doses of 5 to 10 grains.

REPORT ON SPECIMENS OF FIBRE FROM AFRICA.

Read a note from Dr. George King forwarding the following letter to the Viceroy from Dr. M. G. Batta Linares of Alexandria, together with the specimens of fibre therein referred to, and requesting the opinion of the Society's Committee thereon:—

His Honor C. A. Cookson, Esq., Her Britannic Majesty's Consul and Judge for Egypt, having kindly yielded to my request, as to the transmission to your Excellency of a specimen of vegetable silk manufactured by myself from the fibres of a plant which I have discovered, I beg to submit it to your Excellency's examination, humbly asking your Excellency to regard the experiment I made, chiefly under its industrial aspect; and to consider what brilliant results might be obtained from the culture of the plant in question on a large scale in the vast dominions under your Excellency's administration.

The silk plant which I have discovered, belongs to the equatorial regions, and will, I have reason to believe, thrive exceedingly well in India.

I am willing to cede my discovery either by selling it right off, or by assuming the culture of the plant and the extraction of the silk against a proportionate profit.

Hoping that your Excellency will be pleased to take into favorable consideration, what I have humbly set forth in the above lines.

Mr. W. H. Cogswell.—I am unable to name this fibre. It is not hemp, however, and it is not like the aloe or pine apple, and it is difficult in the

absence of a specimen of the plant from which these samples are said to have been prepared, to say what family it belongs to. The Asclepiadaceæ is an order of fibre yielding plants and the genus *Asclepias*, from which the order takes its name, furnishes good fibre, and is capable of being woven into cloth, and for paper making purposes, so we glean from Max Müller's History of Sanskrit Literature. This may be from such like plants. I cannot affix a value to the large sample, it is not worth as much as hemp, but would do as a good substitute at a less cost. The other sample I consider to be worthless, as a spinning fibre, the latter having been destroyed by the chemical process to which it has been subjected, inasmuch as it would not bear the strain of the drawing process in spinning, or to use a practical term, it would not "stand up" in the spinning operation. I consider it fit only for "pulp" for paper making purposes.

Mr. W. Stalkartt.—This fibre is brittle like all the aloe and lily tribe and appears very similar to that of the "Moorva" of India (*Sansevieria zeylanica*) of which I submit sample with a leaf of the plant.

The finer sample has been destroyed in preparation.

Mr. S. H. Robinson.—I agree generally with the above reports; the coarse fibre resembles that of the aloe, but whether it is of any economic value must depend upon the cost of its production as compared with that of jute and hemp. The fine sample in its present state is of no value except as a paper material.

MODELS OF AGRICULTURAL APPLIANCES.

The Secretary called attention to two models of Japanese water lifts recently received from H. B. Majesty's Consul at Yokohama, and to the drawings which accompanied them, one is on the principle of the Archimedean Screw, the other on the tread mill fashion. The latter machine is called the yamato-guruma or yamato wheel, from having first been made in the Japanese province of that name. The Secretary added that there were several other machines of water lifts from China, fibre extractor from Mexico, rice-husker from Demerara, &c., that were yet to arrive which, with those already in the Society's possession, and some promised by local firms, should form a good collection. It was agreed on receipt of the above that a complete list be made and the whole arranged for general exhibition.

INTRODUCTION OF THE JALAP PLANT AT KOTGURH.

In a communication, under date, 26th October, Captain Pogson writes as follows :—

The true Jalap *convolvulus* (*Exogonium Parga*) has succeeded beyond all expectation at Kotgurh. It has grown most vigorously and flowered abundantly, and will I hope under the manure employed ripen seed.

The Jalap has never flowered in the Nilgherries—nor has it done so at Mussoorie. I obtained tubers from both Botanical Gardens, and gave Mr. Stewart 15 and kept one myself. The Tea Plantation being lower down the hill

side, and having a better aspect I knew would suit well. I raised my tuber in a pot and transplanted it into the ground in June in suitably manured soil. The first flower opened on the 14th October, Mr. Stewart's some days' earlier. The Viceroy when visiting the Tea Plantation saw the Jalap plants and broke some of the flowers. These I may say are very pretty, color lilac or mauve. I have kept two of my flowers pressed with a sample leaf and will send them for inspection in due course.

In a subsequent letter of 18th November he adds :—

I have now the pleasure to draw attention to the two dried specimens of Jalap convolvulus sent herewith as also to an illustration of the same, copied from the "Materia Medica" of Bently and Redwood. Mr. Duthie states the plant flowers at Mussoorie, but is silent on the subject of its bearing and ripening seed, and if it does so at Kotgurh, we obtain positive proof of that locality being best adapted for the cultivation of this valuable medicinal tuber.

ANTIDOTE TO WHITE ANTS.

Read the following letter from Dr. R. F. Thompson and submitted the specimen alluded to :—

I read a letter from Messrs. Octavius Steel & Co., in the proceedings of the Society some months back (November 1880) with advertence to white ants causing some of the Managers of their Tea Estates much annoyance and uneasiness. I have given the matter much attention and now beg to submit a sample of a specific prepared *entirely* from vegetable matter which I trust will meet with success, the lower portion of the plant should be painted with it or smeared periodically, it will gradually dissolve and run down, destroy or remove these pests, and tend to nourish the plants or trees. I should like it tried on trees in the immediate vicinity of white ants.

The Secretary mentioned that he had transferred a portion of this material to Messrs. Octavius Steel & Co. who had forwarded it to one of their gardens where the pest is very rife and had promised to communicate the result.

A. H. BLECHYNDEN,

Secretary.

REPORT
OF THE
Agricultural and Horticultural Society
OF
INDIA
FOR 1881.

*Report from the Council at the Annual General Meeting, held on
the 26th January 1882.*

The Council beg to submit their annual report for 1881.

The number of Members elected and rejoined (89) is more than in 1880; but the resignations (55) are greater. The number removed for non-payment of subscriptions (28) is less, but the deaths* (11) are in excess of last year. There have also been removed 14 names for long absence from the country. These reduce the number to 621 which may be classified as follows:— viz., 28 Life-Members; 20 Honorary, Associate and Corresponding, and 573 nominal paying Members. Of this number 47 are absent from India, and 39 have failed to contribute in 1881; thus reducing the actual effective number of paying Members to 487 or 16 more than last year.

The following is a classified list of Members. Of these 120

* Messrs. J. Brander, M. E. de Dombal, C. K. Hudson, G. Aberigh Mackay, T. H. Mosley, Geo. Swaine, A. L. Webster, W. F. Westfield, Col. F. J. Millar, Col. Willoughby Osborne and Baboo Goonendro Nath Tagore.

Report of the Agricultural and Horticultural Society of India. lxxv.

are resident in Calcutta, 431 on other parts of India, and 70 in Europe:—

CLASSIFICATION.	In 60 previous years.	In 1881.	Gross Total.	Total real number at the close of 1881, after deducting lapses.
Honorary Members ...	28	1	29	11
Associate " ...	6	.....	6	2
Corresponding " ...	15	.....	15	7
Civilians, covenanted and uncovenanted ...	804	9	813	73
Merchants and Traders ...	701	16	717	83
Agriculturists ...	906	15	921	203
Military Officers ...	732	7	739	33
Medical ...	281	2	283	23
Asiatics ...	402	15	417	93
Clergy ...	42	2	44	4
Law Officers ...	151	1	152	12
Miscellaneous, Police, Civil Engineers, &c. ...	260	21	281	77
TOTAL ...	4,328	89	4,417	621

Among those who have been removed by death is Mr. C. K. Hudson, of Sylhet. Joining the Society so long ago as 1855, he has rendered good service for many years as a contributor to the garden of Orchids and other valuable plants. The loss of so old and valued a Member is much to be regretted.

Mr. T. H. Mosley is another Member whose death cannot be passed over without a brief record. He joined the Society shortly after his arrival in India twenty years ago. As a partner of the Firm of Messrs. Mosley and Hurst, who were the Agents for the Manchester Cotton Supply Association, he naturally took considerable interest in endeavours towards the improved cultivation of this important staple; and as a Member of the Committee he rendered valuable aid, in reporting on the numerous specimens which were at that period submitted to the Society. Mr. Mosley was too much occupied in business during later years to enable him to give such continued attention to the general affairs of the Society as he desired, but as an earnest well-wisher he was ever ready to render all assistance in his power. The loss of such a Member is severely felt, particularly so in the present day when there exists so few real workers.

The Council have the satisfaction to record that his Excellency the Marquis of Ripon consented, shortly after his arrival in the country, to become Patron of the Society in the room of the Earl of Lytton; and intimated his intention of contributing annually the sum of Rs. 250 towards its funds.

Mr. W. H. Cogswell was unanimously elected President of the Society in the room of Sir Louis Jackson who left India in 1880.

In respect to the financial position of the Society a few remarks only are necessary. The cost for importation of seeds of all kinds is much the same as usual, but the expenditure for the garden is heavier, namely, Rs. 11,070 against Rs. 8,892. On the other hand the receipts are greater, namely, Rs. 9,885 against 4,372 in the previous year. In the expenditure above noted is not included certain liabilities (Rs. 2,840) for importation of roses and rare plants and for heavy repairs to the walks; the latter will not be needed again for some years, and the former will prove a good stock from which to propagate in 1882. The amount to credit of the garden for sales effected in 1881, but not yet realized, is Rs. 857. The Cash Balance in the Bank of Bengal is Rs. 2,843 and arrears of subscription, &c. are Rs. 1,797, making a total of Rs. 4,640. Against this sum there are liabilities to the extent of Rs. 4,125, leaving a balance in favour of Rs. 515. Of the balance of arrears of 1876-80, namely, Rs. 1,788, the sum of Rs. 364 has been removed from the books as irrecoverable, and Rs. 1,228 have been realized during 1881. The arrears of 1881 amount to Rs. 1,601.

The competition at the Annual Flower Show held on the 3rd of February was fully equal to that of previous recent years. The attendance was numerous. In consequence of the unusually large number of plants introduced the space was confined. Certain conditions have been notified to intending exhibitors at the next show, which, it is believed, will not only remedy this but render the task of adjudication much easier.

Garden.—The garden suffered considerably from the severe hail-storm on the 5th of March, which destroyed many trees and damaged the sheds. An improvement in the drainage has been effected whereby the fall of water has been largely secured, and the annual difficulty in this respect has been partially met. The principal roads have been put into a thorough state of repair, and several substantial culverts been introduced in connection with a better system of drainage. Propagation has been considerably enhanced, especially in the Orchard, whereby a much larger stock than usual has been obtained to meet a probable large demand in 1882. The stock of rose plants has been also much augmented, as the demand is constant and annually increasing. A large additional supply of these, as also of other

plants of rare kinds, has been imported during the year from England. The Orchard, it may be observed, is the most valuable portion of the garden; for the Society is thereby enabled to meet the demands of Members and the general public for really reliable grafts of Mangoe, Lychee, Peach and other kinds, in place of those obtainable elsewhere, which cost as much if not more, with the great disadvantage that they are frequently found not to be true to name.

The distribution of plants generally has exceeded that of any former year. Applications for delivery orders have been met to the number of 270, in addition to 60 supplementary orders. Of ornamental plants 14,304 have been issued to Members exclusive of economic plants and cuttings. Moreover, the sales to Members and others have aggregated 4,347 fruit grafts and 4,243 ornamental plants, making a total of 22,894 plants or 10,920 more than in 1880, showing that as the privileges of Members are better known the demand is increasing. It is satisfactory to observe that the public are also availing themselves more largely of this source of supply. The demand for certain other plants, such as Coffea, Guango, Mahogany and a few other timber trees has been steady.

The Council have to tender the thanks of the Society to several contributors of plants during the year, notably to Messrs. W. Stalkartt, R. Nicholson of Mirzapore, E. Koek of Singapore, B. H. Carew, Julpigoree, O. H. Brooks, (Andamans), G. L. Kemp and Col. John May.

The attention of the Society has been directed by the Government of Bengal towards forming a collection of models of agricultural appliances, with the view to their future exhibition. The Council have agreed to appropriate a portion of their large hall for this purpose, and have already collected several models and are waiting the receipt of certain others from various parts of the world before preparing a full list for the information of visitors.

Various subjects have engaged attention during the year some of which may be enumerated, viz : Munjeet, opium cultivation, Manilla hemp, and other fibres, reports on cotton raised in various localities, oil seeds, remedies for cattle disease, culture of the date palm, and maple, and of potatos. The introduction and distribution on an extensive scale of certain kinds of field crops. Trial shipment of fruits from Melbourne and fruits from Kumaon. Measures towards the development and improvement of the future wool trade of India. Culture of the *Eucalyptus* in the Punjab, and of *Pinus longifolia* in various parts of India. Tea cultivation in the Andamans, grape in Cashmere, and American maize in the Kulu district.

Though, as previously recorded, the accession of Members during the past 12 months is above that of the preceding year, it is considerably short of the number elected in several former years. In notifying this fact thus prominently to the Members the Council would again take the opportunity of urgently requesting their hearty co-operation, so as to bring the number annually elected above one hundred. It will be seen that the number of names removed from the list by deaths, resignations and failure in payment of subscriptions, amounts to 94. In a community so very fluctuating as that of India, as respects the European portion, we must naturally expect a certain annual loss, and we should therefore endeavour to recruit more largely to replace such. It is not much to ask each Member to try to add the name of one friend annually to the list. If this were systematically effected we should more satisfactorily progress each year. The Council most seriously commend this suggestion to the very best consideration of the Society at large, hopeful that it will bear good results in the coming year.

*Statement of Receipts and Disbursements of the AGRICULTURAL AND
HORTICULTURAL SOCIETY OF INDIA, from 1st January to 31st
December 1881.*

RECEIPTS.

From Members, subscriptions collected during the year	... ...	16,016	9	7
" Proceeds of country vegetable, acclimated flower and other seeds	... ...	595	4	0
" Proceeds of surplus stock of American and English vegetable, English and German flower seeds, and Melbourne field seeds, &c.	... ...	2,977	2	0
" Government—Proceeds of English vegetable and flower seeds specially imported for H. M.'s Soldiers' Gardens	... ...	3,572	6	0
" Proceeds of copies of Journals of the Society	... ...	1,557	0	0
" Proceeds of copies of other publications of the Society	... ...	72	0	0
" Proceeds of admission tickets for non-Members to the Flower Show held in February	... ...	879	0	0
" Amount of freight repaid	... ...	834	11	9
" Amount of suspense account in deposit for appropriation on various accounts	... ...	31	12	0
" Amount of packing and forwarding charges on seeds, plants, &c.	... ...	2,229	7	7
" Garden—Proceeds of Fruit Grafts	... ...	3,055	9	0
" Proceeds of ornamental plants	5,634	12	0	
" Proceeds of boxes, pots and Wardian cases	... ...	8,690	5	0
" Amount of cartage and packing of plants, &c., &c.	... ...	794	15	6
	... ...	400	6	7
		9,885	11	1
Total, ordinary receipts, Rs.	... ...	34,588	2	0

EXTRAORDINARY RECEIPTS.

From Government of Bengal—Donation from December 1880 to November 1881	... ...	2,400	0	0
" H. E. the Viceroy's Annual Subscription	... ...	250	0	0

Report of the Agricultural

Brought forward	...	2,650	0	0	34,588	2	0	
Rent of large room of the Hall from December 1880 to November 1881	...	1,200	0	0				
Rent of stable and coach-house from December 1880 to November 1881	...	219	3	6				
	_____				1,419	3	6	
					_____	4,069	3	6
Total Receipts	...	Rs.	38,657	5	6			
Balance in the Bank of Bengal on 31st December 1880	...		3,200	14	7			
GRAND TOTAL, RS.	41,858	4	1					

DISBURSEMENTS.

SEED ACCOUNT.

By Messrs. J. Carter & Co., for balance of account due them for seeds	...	...	61	5	6
" Mr. Robert Buist, Jr., for balance of consign- ments of seeds received in 1880 and in part for 1881	...	...	5,606	2	9
" Messrs. Sutton & Sons for dittos ditto for account of the Society	...	6,726 10 5			
And in full for ditto ditto imported for Government	1,328 13 6				
	_____		8,055	7	11
" Messrs. Haage and Schmidt in full for consign- ment of flower seeds received from Ger- many in 1881	...	...	495	15	3
" Messrs. Platz & Sons in full for ditto ditto	...	347	8	9	
" Messrs. Vilimorin Andrieux & Co., in full for consignment of flower seeds received from France, 1881	...		181	5	6
" Mr. W. Adamson in full for consignment of field seeds from Australia received in 1881	...	253	4	1	
" Sundry parties for country vegetable seeds, &c.	...	270	11	0	
" Freight and charges paid on seeds imported for Government	...	41	2	9	
	_____		15,312	15	6

LIBRARY ACCOUNT.

By Messrs. H. S. King & Co., for sundry publi- cations	...	136	0	0	
" Books purchased	...	19	4	0	
" Duftry for binding books	...	25	0	0	
	_____		180	4	0

PRINTING ACCOUNT.

" Printing cash books and ledgers for 3 years— Bye-laws, money receipts, Annual Re- ports, letters of call, &c., &c.	169	4	0
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FURNITURE ACCOUNT.

Repairing chairs	9	0	0
" Furniture purchased	50	0	0
	_____		59	0	0
			15,721	7	6

Brought forward	...	15,721	7	6
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ESTABLISHMENT ACCOUNT.

By Office Establishment from December 1880 to November 1881	...	8,810	8	0
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ADVERTISEMENT ACCOUNT.

„ Advertising notices of meetings, seeds for distribution, surplus seeds for sale, &c., &c.	173	14	6
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FREIGHT ACCOUNT.

„ Freight paid on packages of seeds, plants, &c., sent to Members	...	943	4	9
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METCALFE ACCOUNT.

„ Proportion of house rates from October 1880 to September 1881, and police, lighting, and water rates from January to December 1881	...	544	8	0
„ Sundry petty works to the Building	...	85	6	0
		<hr/>		
		629	14	0

STATIONERY ACCOUNT.

„ Stationery purchased	...	55	13	0
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REFUND ACCOUNT.

Amount refunded, balance of account due to Members	...	2	0	0
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JOURNAL ACCOUNT.

Messrs. T. Black & Co., for printing 600 copies of Journal Vol. vi. Part iii.	...	399	8	0
Subscribing for 50 copies of Baboo P. C. Mittra's Notes on "Agriculture in Bengal"	...	25	0	0
		<hr/>		
		424	8	0

FLOWER SHOW ACCOUNT.

„ Prizes distributed to mallics for exhibiting flowers	...	302	0	0
„ Advertising, printing, carriage hire, fee for band, hire of tents and sundry expenses incurred	...	320	7	6
		<hr/>		
		622	7	6

AGRICULTURAL MODEL ACCOUNT.

„ Cost and charges on two models of water lifts received from Yokohama	...	50	9	0
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PETTY CHARGES ACCOUNT.

„ Postage on letters, circulars, journals, &c., &c., and receipt stamps	...	178	2	0
„ Punkawallahs, carriage, boat and cooly hire, extra packermen, landing and forwarding charges, cost of wax cloth, oil cloth, twine, &c., &c.	...	332	6	3
		<hr/>		
		510	8	3
		<hr/>		
		27,944	14	6

Report of the Agricultural

Brought forward ...	27,944 14 6
GARDEN ACCOUNT.	

By cost of sundry materials for propagation of roses, fruit grafts, orchids, &c., including cost for repairing plant houses and making a new shed	... 509 4 6
,, cost of tools, implements, cartage, &c., of plants and contingencies	... 1,016 14 0
,, Assessment on Garden House and Service Tax	... 193 0 0
,, cost of boxes purchased	... 346 8 3
,, Ditto Pots ditto	711 15 3
	1,058 7 6
	2,777 10 0
,, Salary of Head Gardener, from December 1880 to November 1881	... 1,860 0 0
,, And his Commission on Garden Sales	... 388 15 0
	2,248 15 0
,, Wages of Native Establishment, mallahies, coolies, &c., for ditto ditto	... 3,926 11 9
,, Amount laid out for building a new orchid house	347 13 0
	9,301 1 9

PLANT ACCOUNT.

,, Mr. W. Bull for 2 consignments of Rose plants	... 257 6 10
,, Sundry parties for fruit Seedlings, Liberian coffee seedlings, Orchids, Araucarias, &c., &c., including charges for freight, &c. on plants from different places	... 1,511 10 0
	1,769 0 10
	11,070 2 7
	Total Expenditure, Rs. ...
,, Balance in the Bank of Bengal on 31st December 1881	... 2,843 8 0
	GRAND TOTAL, Rs. ...
	41,858 4 1

MEMORANDUM.

DISBURSEMENTS.		Rs. As. P.	RECEIPTS.	Rs. As. P.	
To amount of Ordinary Disbursements during the Year 1881, as per Statement		2,944 14 6	I Balance in the Bank of Bengal on 31st December 1880	.. 3,200 14 7	
" Amount of Garden expenditure during the Year 1881, as per Statement..	9,301	..	" Amount of Ordin." Receipts during the year 1881, as per Statement	.. 34,588 2 0	
" Amount of cost of plants £ 1,769 chased	..	11,070 2	" Amount of Extraordinary Receipts during the year as per ditto ..	.. 4,069 3. 6
" Balance in the Bank of Bengal on 31st December 1881 ..	..	343 3 6	GRAND TOTAL, Rupees ..	41,858 4 1
			AMT. IN Cash Balance Balance of Subscription, &c., due from Mem- bers for 1879 and 1880	.. 2,843 3 0	
			Ditto ditto in 1881, as follows :-	196 11 0	
			P Balance of Subscription, Rs. 428 14 2 balance of garden account for plants and boxes	..	
			" of seed lacking, freight, .. 857 1 3		
			" &c. 315 11 0	TOTAL, Rupees ..	4,641 8 5
			Memo: Society's proportion cost of erecting the Metcalfe Hall	1,601 10 5	
			In landed property including Building at Alipore	23,557 15 9	
			Grant Testimonial Fund invested in Government Securities ..	20,646 6 0	
				3,949 4 2	
				48,453 9 11	
GARDEN ACCOUNT—Mr. W. Burn, for plant	Total	£ 107 2 10			
Exchange @ 1s. 8d. for the Rs. 90—Rs. ..	1,285 11 2				
£ 158 4 0 @ do. do. .. 1,839 1 9 7					
Meers, Burn and Co, for repairing roads and making culverts .. 1,610 0 0	2,539 9 7				
	4,425 4 9				

and Horticultural Society of India.

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Monthly Proceedings of the Society.

Thursday, the 26th January 1882.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting were read and confirmed.

The Report from the Council was read.

At the conclusion of the reading of the Report, the President addressed the Meeting as follows :—

Gentlemen,—In submitting for adoption the annual report of the Council for the past year, I think a fitting opportunity is afforded me of making a few remarks in regard to the working of the Society and its position, as gleaned from the statements and accounts now before us.

Though there are many older members on the list than myself, one of sixteen years standing, yet I imagine there are few who are better acquainted with its antecedents, or who have derived more pleasure from a careful perusal of its transactions and journals from its earliest history.

There can be no doubt that the Society has done much real good, as its valuable records fully prove. They are in themselves a store house of useful information, and it is unfortunate that many of them are out of print. I find that several subjects that have been brought to the notice of the public during recent times, were introduced and freely discussed years ago in those publications.

In former days the Society stood alone as the depository for all matters connected with Agri-Horticulture, and the Government of the day recognised it as a very useful medium of communication with the public. Now, however, times are greatly changed. The Government of India have inaugurated a department of their own, whilst the Government of Bengal have established an Economic Museum, to which are naturally referred specimens of produce which were formerly submitted to this Society. Again certain Industries have their own publication, such as the *Indian Tea Gazette*, the *Indian Forester*, and for general subjects the *Indian Agriculturist*, consequently the Society's journal has become an annual instead of a quarterly publication. If, however, we refer to the monthly proceedings of the Society during the past few years, we shall find that they contain many subjects of great interest. The report just read gives a brief notice of some of these during the year 1881.

But although the times have changed and we find new departments of Government being created, whose functions are somewhat allied to those of our Society, yet constant references are being made to this venerable institution

constituted nearly sixty years ago, shewing that its great utility remains unimpaired and that it is as well recognised as it was in days gone bye, when Lord Auckland, as Governor-General of India was its Patron, and in an able minute penned by His Lordship, so far back as 1836, on the cultivation of cotton, and suggesting the mode in which it should be prosecuted, he added the following remarks. "In Bengal, I believe, the objects to be well provided for by the excellent measures and admirable zeal of the Agricultural and Horticultural Society of India, to that Society I consider the Government and the community to be under the highest obligations."

There is not needed stronger testimony to the successful exertions the Society has made in the cultivation and fostering of most products, prominent amongst which are Silk, Cotton, Flax, Hemp, Aloe, and Fibres of various classes, Sugar, Coffee, Tea, Rice, Seeds, and Cereals of different kinds, Potatos, Munjeet, Mowah and other oils; and in more recent days that of Cinchona, which promises to confer such wide spread blessings.

It is satisfactory to find that our Garden is making good progress, and though the expenditure on so large a plot of ground is unavoidably heavy, I have confidence that ere long it will become self-supporting, if it continues to receive the same careful and able supervision that it has done during the past year. Too much attention can scarcely be given to the Orchard, which I regard as the most useful and profitable portion. The economic garden will also, I trust, receive additional consideration during the present year, not only as regards the propagation of certain well known useful products, but in the introduction of newer kinds, which may be profitably grown in Bengal. I would rather that our plot of ground at Alipore were regarded as a nursery than a flower garden, more devoted to useful than to ornamental plants. The latter cultivation must of course be continued to meet the annually increasing requirements of our Members, but I consider it should be subservient to the former.

Before closing, I wish to offer a few remarks in support of what is stated in the report regarding the increase to the list of our Members. It is absolutely necessary that this should be accomplished if only to maintain our status, but I wish to see more than that effected. Notwithstanding the fluctuating state of the European community in India, I see no reason why we should not double our present list. It could be easily done if each member would propose one friend annually. I have done my best in this respect during the past year, resulting in ten new members, and I should have been glad if others had been equally successful. The proportion of resident to non-resident members is 120 to 431. That is a small number when we consider the present large and increasing community of this city; it should be doubled, and this might readily be achieved if those who are not birds of passage, but who should be naturally interested in the produce of the soil—I allude to the Hindu and Mahomedan community—could see their way to join our ranks more largely. I commend this to the special attention of our native fellow members, among whom we have

some zealous and very influential supporters, in the hope that their example and great efforts will bear good fruit, and that no feeling of lukewarmness will deter one and all in vigorously prosecuting the interests of the Society, whereby an increased membership and strengthened combination will add very materially to its welfare and future standing.

I must lay claim to the hearty co-operation of the Members of this Society, of which I have the honor to be President, hopeful that with their valuable assistance its progress may be as great and successful in days to come as it has proved to be in the past under my illustrious and able predecessors, who so efficiently held this high office.

With these remarks I beg to propose the adoption of the report.

The report was unanimously adopted, and the best thanks of the Meeting were voted to the President for his interesting and useful remarks.

The election of Officers and Council was next entered on with the following result:—

President.—Mr. W. H. Cogswell.

Vice-Presidents.—Mr. S. H. Robinson, Mr. G. L. Kemp, Baboo Joykissen Mookerjee, and Rajah Suttyanundo Ghosal, Bahadoor.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. J. E. MacLachlan, Mr. R. Blechynden, Dr. G. King, Mr. H. J. Leitch, Dr. S. Lynch, Baboo Pratapa Chandra Ghosa, Mr. W. Stalkartt, Mr. J. G. Meugens, Mr. W. Pigott, Mr. H. A. Firth, Baboo Peary Chand Mittra, and Mr. W. S. Creswell.

The names of the following gentlemen were submitted for Membership:—

Herbert Finch, Esq., Meeconah, Shahjehanpore,—proposed by Mr. G. L. Kemp, seconded by Mr. J. E. MacLachlan.

Baboo Ramchunder Chatterjee, Kalleine Cheera Tea Estate, Kalaen, Cachar,—proposed by Baboo P. C. Mittra, seconded by Baboo Joykissen Mookerjee.

Shuldham Henry Shaw, Esq., Tea Planter, Moheena, Golaghat,—proposed by Mr. H. J. Leitch, seconded by Mr. Kemp.

Manager Roobhenee Tea Garden, Cachar,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

H. R. Cooke, Esq., Assistant Secretary, Foreign Department,—proposed by Rajah Suttyanundo Ghosal, Bahadoor, seconded by Baboo Peary Chand Mittra.

Rejoined—Manager of the Koomber Tea Estate, Cachar.

A Report from the Garden Committee was submitted and adopted in respect to provision of vegetable, flower and agricultural seeds from Europe, America, and Australia for next season.

Thursday, the 16th February 1882.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the Annual General Meeting were read and confirmed.

The following gentlemen were elected Members :—

Messrs. Herbert Finch, S. H. Shaw, H. R. Cooke, Baboo Ramchunder Chatterjee, and Manager, Roobhenee Tea Garden, Cachar.

The names of the following gentlemen were submitted as desirous of joining the Society :—

Baboo Mahabeer Persad Sah, Rai Bahadoor, Chupra,—proposed by Baboo P. C. Mittra, seconded by Baboo Joykissen Mookerjee.

Patrick Playfair, Esq., Merchant, Calcutta,—proposed by Mr. W. H. Cogswell, seconded by Mr. H. J. Leitch.

Baboo Ramessur Maliah, Howrah,—proposed by Mr. Cogswell, seconded by Mr. W. Stalkartt.

J. Flemington, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. W. Pigott.

C. Walters, Esq., N. B. S. Railway, Saidpore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Baboo S. P. Chatterjee, Calcutta,—proposed by Mr. W. Pigott, seconded by Mr. Cogswell.

Mrs. Ellen Munro, Calcutta,—proposed by the Secretary, seconded by Mr. R. Blechynden.

Dr. Berkeley, Xth Royal Hussars, Lucknow,—proposed by Mr. J. Gannon, seconded by the Secretary.

W. J. McCaw, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by Mr. J. W. O'Keefe.

G. Thomas, Esq., Merchant, Calcutta,—proposed by Mr. Cogswell, seconded by the Secretary.

CONTRIBUTIONS.

1. Report on the Administration of Bengal, 1880-81, and on the Internal Trade of Bengal, 1880-81. From the Government of Bengal.

2. Report on the progress and condition of the Royal Gardens at Kew during 1880. From the Director.

3. Proceedings of the Asiatic Society of Bengal, November 1881. From the Society.

4. Transactions of the Asiatic Society of Japan, Vol. 9, Part 3. From the Society.

5. Proceedings of the Agri-Horticultural Society of Madras for October 1881. From the Society.

6. Report of Committee of Bengal Chamber of Commerce, for half-year ending 31st December 1881. From the Chamber.

7. Three kinds of *Cupressus* seeds. From the Superintendent, Botanic Garden, Saharanpore.

8. Six seeds of a rare palm (*Areca Passalaequa*) from the Nubian Desert. From Dr. G. Schewenfurth.

9. Ten pounds of "Japan Pea." From the Superintendent, P. and O. Company, Yokohama. This is the pea which Captain Pogson brought to notice at the Meeting in September last. The Secretary intimated that he had sent a portion to Captain Pogson, to Government of India, Agricultural Department, and to a few other persons, and there was still some available for applicants.

ANNUAL FLOWER SHOW.

The Report of the Judges (Dr. G. King, Messrs. G. L. Kemp, V. P., H. A. Firth and Rajah Suttyanundo Ghosal, Bahadoor, V. P.) on the Exhibition of Flowers held on the 3rd February was submitted as follows:—

The collection of plants was less than at last year's Show, and the competition was also less, being confined to some 16 gardens, 14 of whom gained prizes, but the quality of the plants submitted, especially of handsome foliage, was superior to any previous Exhibition. The collection of Crotons, Begonias, Coleus, Anthuriums, Dracænas, Dieffenbachias, Marantas, &c., was excellent, especially the Crotons. There were also some fine Camellias and Geraniums, and a good display of Ferns and some pitcher plants. The roses (plants and cut specimens) were not equal to last year. This remark applies also to annuals, though there were good examples of violets, asters, phloxes, pansies and verbenas.

The Royal Botanic Garden contributed again an exceedingly interesting collection for exhibition only. Among these were Centroselma bullata, Peperomia obliqua, Maranta eximia, Homalomena rubra, Phyllaguthis rotundifolia, Cyrtodeira metallica and chantalensis, Sonevila margaritacea, Miconia pulverulenta, Bowea volubilis, Bramea insignis, Dioscorea metallica, Eucophalatus villosus, Davallia Griffitheana, Asplenium Belangeri, Vitis porphyrophylla, Dracæna Kunstterri and many others.

There were four competitors for the Grant Silver Medal for "the best collection of plants of any number of kinds." The prize was awarded to S. P. Chatterjee whose collection was not only good, but exceedingly well arranged.

Extra prizes to the value of Rs. 67 were awarded from the sum (Rs. 100) placed at disposal by the President, for fine plants not included in the schedule, and Rs. 414 were awarded for the latter. A list in detail is annexed.

The arrangement of the specimens shewed a marked improvement in last year, more time having been allowed for that purpose.

The attendance of visitors was greater than last year, probably 1,500.

Their Excellencies the Viceroy and the Marchioness of Ripon, and His Honor the Lieutenant-Governor, honoured the Show with their presence, and His Excellency kindly placed his band at the Society's disposal. His Honor the Lieutenant-Governor also granted his shamianas, and collections of annuals, to assist in the general arrangements, and add to the interest of the Exhibition.

Baboo S. P. Chatterjee being present by invitation, the President, with a few

prefatory remarks on the artistic skill displayed in the arrangement of his excellent and valuable plants, presented him with the handsome Silver Grant Medal, of which was an appropriate inscription, and hoped he might be equally successful on future Annual Exhibitions, and that this deservedly won prize might form one of many similar trophies which would doubtless fall to his lot if he persevered in his profession.

In connection with the above Baboo Praesono Coomar Banerjee submitted a schedule of prizes amounting to Rs. 130 awarded at the Flower Show (consisting principally of annuals,) held in the Government House Gardens on the 8th February.

COTTON.

Submitted the following letters with specimens therein referred to :—(See body of the Journal.)

MODELS OF AGRICULTURAL AND ECONOMIC APPLIANCES.

The Secretary called attention to models of three Chinese methods of raising water for irrigating purposes, transmitted by H. B. M. Consul at Shanghai. It was agreed that these be placed with other models now collecting in the Society's large hall preparatory to a General Exhibition as soon as others, shortly expected, are received.

SPORT IN A CITRON.

A letter was submitted from Mr. Ross Scott, c. s., at Dehra Doon, relative to a curious sport in the fruit of a Citron. The following is extract of Mr. Scott's letter :—

"I send you by to-day's post a peculiar growth from one of the orange trees in the Kk-Amir Yakub Khan's garden, which was given to me this morning. I have not been able to find out much about it, but I believe nothing of a similar shape has been observed on the tree before. It is a very peculiar production, and I shall be glad if you can tell me any thing about it."

The Secretary stated that he had shewn this curiously formed fruit to Dr. King who had kindly offered the following remarks thereon :—

"Your Dehra Doon correspondent's curious fruit is a Citron in which the carpels, instead of being united in the usual way and covered by a common pericarp or skin have remained separate and each has developed a pericarp for itself. Moreover the axis, instead of bearing one whorl of carpels, is prolonged and on the prolongation a second abortive whorl is borne. Oranges and Citrons are greatly given to producing sports their fruits, but that sent by your correspondent is one of the most remarkable I have ever seen."

If the tree which produced it, produces any more like it I should greatly like to get them for the Museum here."

POTATOS FROM KUMAON.

Read a letter from Mr. Lictard, of the Revenue and Agricultural Department, intimating that the Department had recently received, but too late in the

season, a good quantity of fine potatoes from Kumaon to meet a request from the Commissioner of Assam, and it was at the disposal of the Society. The Secretary mentioned that as these potatoes could not be sown at the present season in any part of Bengal he had transferred them to Messrs. Lloyd & Co., for trial in their Tea Gardens at Darjeeling. Messrs. Lloyd had promised to communicate the result.

TRANSMISSION OF FERNS BY PARCEL POST.

Dr. Thomas Beaumont in a letter recently received from Hyderabad, Deccan, thus writes. "You may be interested to know that Ferns carry pretty safely from England by parcel post. I had eleven new Adiantums out lately. They are all growing except two; cost in England 2s. 6d. each all round. Postage, Rs. 8."

PULVERISING AND SMOOTHING WHEEL HARROW.

Submitted the following extract of a letter from Captain J. F. Pogson on the above machine:—

"I have forwarded for submission to the Council of the Society, an illustration cut out of the *Tasmanian Mail* sent me a few days ago by a friend.

"The pulverising and smoothing wheel Harrow," is deserving of attention. In place of two horses, one camel put in shafts, would answer all purposes. In Hansi and Hissar districts, I believe camels are used for ploughing, and if with this new implement 12 furrows and ridges could be made at a time, the saving in labor as well as time would be immense.

A camel will eat anything green including "neem" leaves. Dry fodder suits him well, and all kinds suffice. The manure of the camel is very rich in ammonia, and most valuable; and as one camel will do the work of two oxen, besides being always available as a beast of burden, the value of the camel over the ox is apparent, and has only to become generally known to be appreciated."

THE BROOM CORN OF NORTH AMERICA.

In a subsequent letter Captain Pogson calls attention to the above cereal in the following words:—

I received the *Tasmanian Mail* newspaper of the 3rd December last yesterday, and give beneath an extract taken therefrom. Extract—"Says the *True Republican*, an Illinois." (U. S. A.) paper:—Broom corn, a semi-tropical, is likely at no distant day to revolutionize the bread stuff of the world. A process has been discovered by which the finest and most delicious flour can be made from the seed to the extent of one-half its weight, and leave the other half valuable food for making milk and beef. The average yield per acre is 300 bushels, and in many instances 500 bushels, or 30,000 lbs. have been secured. Nor does it exhaust the soil, as Indian corn, from the fact that it feeds from the deeper soil, and assimilates its food from a cruder state. It belongs to the same genus, as the sweet cane, commonly known as the Sorghum.

ghum, which, as an article of food, is growing rapidly in public esteem, and from the seed of which a most nutritious flour can be obtained."

My object in asking you to submit the above for the information of the Council of the Agri-Horticultural Society is to cause inquiry to be made into the matter and if the statement put forth is reliable, to order a good supply of this remarkable cereal to be sent to your indent without delay.

Three hundred bushels, at sixty pounds per bushel, equal 18,000 lbs., which divided by 82, gives as quotient two hundred and nineteen maunds and 42 lbs. !!!

If this be true, the ryots and Zemindars of India, will soon be rich and prosperous, and as the cultivation of all inferior kinds of food grains, (cereals) would cease, the khurreef, or rain crops, which would include the above would be amply sufficient to over feed the population for 12 months, and admit of three quarters, or 75 per cent. of the wheat grown and harvested to be available for export to the United Kingdom.

In the extract quoted, this most prolific cereal is alluded to as a kind of Sorghum, and it would be very remarkable if it proves to be an unknown variety of our Indian *Jowar* or *Holcus sorghum* of Semi-tropical America.

In continuation of the above Captain Pogson adds—

As regards the wondrous "Broom Corn," of Illinois, it must be something very superior, and distinct from the ordinary "Broom Corn," of America, and of which two kinds are offered by Mr. R. Buist, Junior, Seedsman, Philadelphia, viz., "Broom Corn," (Dwarf ever green), per bushel \$ 400 per quart \$ 25.

"Brom Corn" (Tall.) bushel 300, quart 25. Both these may be American varieties of "Sorghum vulgare," but neither are noticed for their yield, as compared with the "Illinois" variety.

If this particular variety proves to be a genuine "Sorghum," we must give it a new name, in place of "vulgare." No "Jowar," known or grown in India ever produced 18,000 pounds of grain to the acre, whereas this Illinois variety has produced 30,000 lbs. per acre. It seems almost incredible. I hope the Council will sanction this cereal being indented for, and Government would do the same if asked, I mean that the Society should obtain the seed for Government."

Letters were read—

1. From Col. J. May, Dinafore, presenting a short paper on his mode of cultivating the Rose plant.
2. From W. Coldstream, Esq., submitting several papers connected with the cultivation of the Tussar silk worm in the District of Hoshiarpore, in the Punjab.
3. From Major M. Protheroe, C. I. E., forwarding Major Wimberly's report on the cultivation of certain products in Ceylon *quoad* their introduction into the Andamans.

(The above were transferred for the Journal.)

4. From Under-Secretary Government of Bengal, forwarding a further and larger quantity of the Bariala fibre from the Rajah of Bolihar, in connection with previous papers on the subject, (*see Proceedings of March 1881.*)

Thursday, the 28th March 1882.

W. H. COGSWELL, Esq., *President, in the Chair.*

THE Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. Patrick Playfair, J. Flemington, C. Walters, W. J. McCaw, G. Thomas, Dr. Berkley; Mrs. E. Munro, Baboos Ramesur Malia and S. P. Chatterjee.

The names of the following gentlemen were submitted as desirous of joining the Society: —

T. S. M. Riach, Esq., Manager of the Kinikor Tea Estate, Assam,—proposed by H. J. Leitch, Esq., seconded by G. L. Komp, Esq.

H. Cave, Esq., Korar Factory, Purneah,—proposed by the Secretary, seconded by J. E. MacLachlan, Esq.

Goodwin Norman, Esq., Broker, Calcutta,—proposed by W. H. Cogswell, Esq., seconded by W. Stalkartt, Esq.

Rejoined—J. Boyce, Esq., of Serajgunge, J. P. Grant, Esq., c. s., Hooghly, and R. J. Crossthwaite, Esq., c. s., Calcutta.

Dr. J. Forbes Watson, late of the India Museum, London,—proposed on the recommendation of the Council as a Corresponding Member.

CONTRIBUTIONS.

Indian Forester for January 1882, and the *Tropical Agriculturist* for February and March 1882. From the Editor.

Memoirs of the Geological Survey of India, *Paleontologia Indica*, Vols. 1, 3 and 11, Parts 1 and 2, and Memoirs of the Geological Survey of India, Vol. XIX. Part 1. From the Director.

Seed of *Eucalyptus citridora*. From L. A. Bernays, Esq.

A lot of Rose cuttings. From Dr. Griffith.

A phial of Yerba Maté. From F. F. Wyman, Esq.

A Manual of Indian Timbers, by J. S. Gamble, Esq., M. A.

Suggestions regarding Forest Administration in the N.-W. Provinces and Oudh, by Dr. Brandis, F. R. S. From the Government of India.

Report of the third International Geographical Congress. From the Asiatic Society.

Letters were read—

1. From Mr. Jas. H. Gregory, of Boston, with copy of his catalogue of various kinds of Maize.

Proceedings of the Society.

2. From Assistant Secretary, Government of Bengal, an enquiry respecting the plants of *Musa Textilis* made over to the Society. The Superintendent of the Gardens reports that only three out of the ten plants received are at present in leaf, and suggests that any opinion be withheld till after the rains have set in, when a full report shall be furnished thereon.

3. From J. Holderness, Esq., Assistant Secretary, Government of India, returning thanks for a quantity of Japan pea seed, and enquiring as to its scientific name.

4. From Captain J. F. Pogson, Dehra Doon, on the subject of "Branching Dowra," Cuzco Maize, and "Blunt's Prolific Field Corn," suggesting the importation of seeds from Boston. Ordered that a small quantity of each kind be imported from Mr. Gregory.

5. From Captain Pogson advocating the desirability of Government introducing on a large scale "Golden Grain or the Mammoth Wheat of Palestine."

6. From J. Holderness, Esq., Assistant Secretary, Government of India, Department of Agriculture, offering a further quantity of potatos for the Society to distribute.

7. From R. Nicholson, Esq., Mirzapore, offering some potatos raised from American seed. In both these cases the Society have been obliged to decline the offers owing to the lateness of the season.

8. From E. C. Buck, Esq., Officiating Secretary, Government of India, Revenue and Agriculture Department, enquiring whether any experiments have been made in the Bengal Presidency in the cultivation of *Arracacha esculenta*, and with what result. A full reply has been deferred pending reference and enquiry.

9. From Baboo Joykissen Mookerjee, V. P., soliciting information on tobacco culture and curing, and asking for a supply of tobacco and cotton seed. Ordered that seed be furnished, and that such information as has already been published be supplied.

10. Letter from Mr. W. Aitchison, of Cachar, sending specimens of the bark of a tree which he thinks may be a Cinchona.

This bark was submitted to Dr. King who is unable to name the plants on the imperfect materials furnished, but is satisfied it does not belong to a species of Cinchona. Suggests that leaves, flowers, and if possible fruit be forwarded when further enquiry can be made.

PARAGUAYAN YERBA MATE.

Mr. W. S. Cresswell reports on the above as follows: The liquor has a pungent acrid flavour very unpleasant to the taste, with none of the properties of the Tea Plant in leaf or liquor, and should the inhabitants of the River Plate have an opportunity of tasting our Indian Tea, they would never go back to their Maté Tea again.

COTTON.

A second communication from Mr. Broomfield, of Khorda, Orissa, suggesting the cultivation of cotton in Orissa, by Eurasians, as a profitable industry. It was ordered that copies of the letters should be forwarded to the Secretary of the Eurasian Association.

Thursday, the 27th April 1882.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. T. S. M. Riach, H. Cave, G. Norman, and Dr. J. Forbes Watson, as a Corresponding Member.

The names of the following gentlemen were submitted as desirous of joining the Society.

J. R. Bryce, Esq., Sagrampore Factory, Bhagulpore,—proposed by W. H. C. Grant, Esq., seconded by the President.

Baboo Opendra Chundra Singh, Zemindar and Honorary Magistrate, Bhagulpore,—proposed by Baboo Rung Lall Singh, seconded by the Secretary.

Sam. Barry, Esq., Kellyden, Assam,—proposed by H. J. Leitch, Esq., seconded by G. L. Kemp, Esq.

J. Aitkin Middleton, Esq., Tea Planter, Assam,—proposed by the Secretary, seconded by W. G. Purcell, Esq.

Baboo Mohes Chandra Biswas, of Jammoo, Sealkote,—proposed by the Secretary, seconded by R. Blechynden, Esq.

As a Life Member, His Highness Maharana Sajjan Singh Bahadoor of Mewar, G. C. S. I.,—proposed by J. P. Stratton, Esq., seconded by the President.

CONTRIBUTIONS.

From Phytologic Museum of Melbourne, 6 seeds *Macrozamia Fraserii*.

From Superintendent, Botanical Gardens, Trinidad, seeds of "Euterpe Montana," "Chamarops Stamacantha," "Bactris Sp."

From Agricultural and Horticultural Society, Madras.

Proceedings of Agricultural and Horticultural Society, Madras, 7th December 1881 to 11th January 1882.

From Editor. *Tropical Agriculturist* for April.

From Asiatic Society of Bengal. Journal of the Asiatic Society of Bengal extra number to part 1 for 1880, and proceedings of Asiatic Society of Bengal for January and February 1882.

From Royal Asiatic Society, Journal of the North China Branch of the Royal Asiatic Society for 1881, New Series, Vol. XVI.

From W. H. Cogswell, Esq., a quantity of acclimatized *Bahnia* seed, also half a ton of cotton seed for cattle food.

From H. A. Firth, Esq., about 25 tons manure, and a large quantity of plant labels.

COTTON.

Read a letter from Mr. A. A. Shircore, Jallander City, on two samples of cotton grown by him:—(See body of the Journal.)

Read the following letter from Mr. Wm. Claxton Peppe, of Birdpore, Goruckpore:—

I am sending you to-day the flower, leaf and seed-pod of a tree growing in the compound here. The seed, I think, originally came from Burmah. The trees must be about 40 years old, height about 30 feet, diameter 2 feet. I should be much obliged if you could give me the name of it and where I could get any particulars about it. For the last month it has been one mass of flower and a magnificent sight. In the last Society's Journal, I see a notice of white gram and wheat barley, I send you samples of each grown here this year. The smaller white gram can be had in any quantity here. The weevil or ghun does not readily attack it, whereas it very soon does for the common red gram. The larger gram is from a few seed I got from a friend some years ago. It thrives well, bears profusely, and the plants grow some three feet high. This year, owing I think to it being sown in very rich land, the caterpillars attacked it, after nearing maturity.

The wheat barley promises to be a great success. It was the first ripe and first cut of any rubi crop about here. The standing crop was a magnificent sight. The produce from $\frac{1}{4}$ acre manured with bone dust was 1,156 lbs., straw 1,640 lbs., the produce from $\frac{1}{4}$ acre manured with ordinary farm yard manure was 25² lbs. and straw 410 lbs. A bearer here, a hill man, who came down with us from Mussoorie, tells me they have any quantity of this gram, but larger and finer in his village some six days' march from Mussoorie in the Sidi Raj. (These samples were laid on the table, and considered to be of good description.) I send you the leaves of two gum trees growing in Goruckpore some maintain they are the Eucalyptus globulus, but I do not think so. Will you kindly say what they are? The trees are fine healthy trees 40 feet high, two feet diameter, and very pretty and graceful.

Dr. King has kindly reported on the two trees referred to in the above letter—the first being Cassia grandis, and the other Eucalyptus marginata.

Thursday, the 29th June 1882.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. J. R. Bryce, Sam. Barry, J. Aitkin Middleton, Opendra Chundra Singh, Mohes Chundra Biswas. As a life member, His Highness Maharana Sajjan Singh Bahadur of Mewar.

The names of the following gentlemen were submitted as desirous of joining the Society :—

W. Mackenzie Bradley, Esq., Merchant, Calcutta,—proposed by H. J. Leitch, Esq., seconded by G. L. Kemp, Esq.

Manager Tarabarie Tea Estate, Darjeeling Terai, Silligorie,—proposed by H. J. Leitch, Esq., seconded by G. L. Kemp, Esq.

Major Warburton, Political Officer, Khyber,—proposed by Lieut.-Colonel Hawkins, and seconded by the Secretary.

W. Maitland Heriot, Esq., Merchant, Calcutta,—proposed by W. H. Cogswell, Esq., and seconded by G. L. Kemp, Esq.

Rejoined—The Secretary Public Gardens, Monghyr.

CONTRIBUTIONS.

Baron Ferd. Von Mueller, K. C. M. G., M. & P. H. D., F. R. S., "Eucalyptographia." A descriptive Atlas of the Eucalypts of Australia and Development of rural industries Australia.

From Government of India—Records of the Geological Survey of India, Vol. XX, Parts 1 and 2 of 1882.

From Government of India—Hand book of the collection of the wild silks of India, by Thos. Wardle.

From Government of India—*The Indian Forester* April 1882.

From Government of India—General Trade Report, Bengal Presidency, by Collector of Sea Customs 1881-82.

From Secretary—Report of the Council of the North China Branch of the Royal Asiatic Society for 1881.

From Secretary—Proceedings of the Asiatic Society of Bengal, No. III, March, 1882.

From Secretary—Journal of the Asiatic Society of Bengal Vol. Part I, No. 1 of 1882.

From Secretary—Proceedings of the Asiatic Society of Bengal, No. IX, April 1882.

From Secretary—Proceedings of the Agri-Horticultural Society of Madras for 8th and 25th March, and 5th April 1882.

From Secretary—Annual Report of the Agri-Horticultural Society of British Burmah, 1881.

From Secretary—Report of the Bijnor Agricultural Society for 1881-82.

From Dr. Geo. King a packet of mahogany seed.

From W. H. Cogswell, Esq., a further quantity of Bahmia Cotton seed.

From A. H. Blechynden, Esq., Cassia seed from Ceylon. (*Cassia grandis*.)

From W. Stalkartt, Esq., a quantity of Asparagus ascendens.

For the whole of which the thanks of the meeting was recorded.

Read a letter from W. Aitchison, Esq., applying for several varieties of Cinchona seed. The Secretary intimated that the same was partially complied

with, from such seeds as were available, through the courtesy of Dr. Geo. King.

Read a letter from H. W. I. Wood, Esq., Secretary, Bengal Chamber of Commerce, forwarding letters, papers and specimens of Rhea and its fibre, from Government, for whose information he wished to be favored with a report thereon.

Mr. W. H. Cogswell has given the Society his views as follows:—

I refrain from furnishing a detailed report but content myself by saying that I am of opinion the samples submitted are an advance in the right direction, and an improvement on many experiments, the results of which have been so frequently submitted to this Society during the last thirty or forty years. The fibre has not, however, yet got beyond the experimental stage in this country, has not assumed the position of a staple product, and consequently a reliable and valuable opinion cannot be formed of its commercial value in this market, as its consumption is purely local, and on a very limited scale amongst the fishermen for lines and nets, &c., &c.

Its cost from the very slow and tedious preparation by hand labor, must greatly operate against its full success as a profitable commercial pursuit, and it would be desirable that some reliable data should be furnished of the actual charges in producing the fibre, in juxtaposition with the real worth of it, from valuations which can be readily obtained in the English market, in order that the margin of profit if any, could be ascertained.

I have, however, grave doubts if fairly remunerative results can be achieved until a machine has been perfected for the production of the fibre on a proper commercial scale.

I note with regret, that the action of Government has been lately withdrawn with reference to the mechanical requirements that are necessary to produce this fibre, and I think they should renew and extend the terms of that premium, as it offered valuable inducement and gave great encouragement in the several efforts that were being made towards the accomplishment and full development of the right and needful object.

Read a letter from Captain Pogson, of Mussoorie, regarding potato cultivation in India for export to Europe, suggesting that seed potatoes should be obtained from Australia, New Zealand and Tasmania in time for sowing in October—November the crop so raised being ready for export in March: suggests the keeping of Tubers from the South to preserve them for sowing after the rains, by placing them in stone jars, covering them with honey and hermetically sealing them, or if partly dug up, washed, dried and immersed in cold water, 40° F. for an hour or more, then shaken in a basket to get rid of excessive moisture, quickly packed in a felt lined box, with charcoal dust, alternate layers, and the lid nailed down, that the cold absorbed would keep the germs or eyes dormant until wanted for sowing.

GARDEN REPORT FOR JUNE 1882.

The several plant houses have been repaired, also the cattle shed, at a trifling expense, the bamboos from the hedge being utilized for this purpose.

Out of the 800 Rose plants received from Mr. W. Bull in December 1881, by P. and O. Steamer, only 176 have survived, this heavy mortality was occasioned through the plants having been conveyed in the lower hold of the vessel, and not in the 'tween decks, as requested by the Secretary, when the order for the plants was sent.

Several beds have been manured, and prepared in anticipation of a batch of Rose plants from England during the ensuing cold season, and a farther supply of 800 plants is desirable to fill up spaces that have been cleared of such plants, which were introduced for the purpose of filling up gaps when the garden was first laid out.

The entrance at the west gate has also been cleared and Roses planted out, this will have a better effect than formerly.

A border of Roses has been planted out adjacent to the south west belt of bamboos as an experiment, and notwithstanding the warning of native gardeners, that the plants would never thrive, I find they are the healthiest in the garden.

Propagation of plants at this season has been taken in hand vigorously, but we have to contend with weeds as well, which at this time of the year thrive and re-produce themselves with rapidity. Numerous orders for useful plants have been registered, and their production has found full occupation for the staff.

Crotons and other plants recently imported per Mr. W. Bull, are now being propagated from, and it will be necessary to introduce the same in a fresh catalogue in the course of a few weeks by which time the cuttings will have rooted.

Considerable discussion among the leading Amateur Rosarians in England has recently occurred, and the bulk of opinion is against budded Rose plants. My reason for drawing special attention to this is that out of the three extensive Rose beds planted out here, from supplies purchased from three distinct institutions in the N.-W. Provinces, there are very few plants that did not degenerate in a season or so.

Out of a lot of Rose plants received last year from the N.-W. Provinces, not a single one survived: the cause of mortality, I attribute to the same having been dug up from beds, and the strain on their vitality being much greater than if they had been in pots.

Not a single plant of *Musa textilis* received from the Government has survived, and I find by perusal of report of the Society of British Burmah that the plant is unprofitable.

Seed of *Eucalyptus citriodora* germinated freely, but the plants are leggy, and do not promise to thrive in Bengal, the fact being the climate is too damp. While in the open the rain was destroying them, but since removal to the glass house they are healthier.

As considerable attention has been attracted to plants suitable for paper manufacture it may be worth mentioning "Broussonetia papyrifera" and a perusal of Paxton's pocket botanical dictionary, page 50, will explain its valuable properties; it produces glue, paper, and the finest of cloth under manufacture. The introduction of this plant may in the first instance be expensive, possibly Government may help with a special grant for this purpose.

It would be desirable for members to indent for their supplies of plants as soon as possible, so that the same may have quick attention, and ease the work of the packing staff, by not having all the orders in a rush.

I now beg to draw attention to the very large stock of choice English Peach grafts ready for issue, also Mangō, Lichee, and other fruit plants.

Our foreign correspondence continues satisfactory, and in the course of another few months, the valuable flora of this garden will be greatly augmented.

I have now to mention the resignation of a Garden Assistant, Mr. E. F. Cornelius, who has accepted service under the Colonial Government at Fiji. He has been kind enough to undertake the care of a Wardian Case of suitable plants to that Government, and see that the same is filled up with such, in return, as would be acceptable to the Society.

As the demand for seed of Reana luxurians is increasing, I am now planting out a few biggahs in the economic portion of the Garden, so as to be in a position to meet indents.

Thursday, the 27th July 1882.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting were read and confirmed.

The President had the pleasure of intimating that the Hon'ble Rivers Thompson, Lieut.-Governor of Bengal, had expressed his willingness to join the Society.

The following gentlemen were elected Members:—

W. Mackenzie Bradley, Esq.; the Manager Tarrabarrie Tea Estate, Darjeeling Terai, Silligorie; Major Warburton, W. Maitland Heriot, Esq.

Rejoined—C. H. Pope, Esq.

The names of the following gentlemen were submitted as desirous of joining the Society:—

J. M. Sherman, Esq., Senior Master Pilot, Calcutta,—proposed by R. M. Daly, Esq., seconded by the Secretary.

H. Bell, Esq.,—proposed by the Secretary, seconded by J. E. MacLachlan, Esq.

H. J. F. Freeman, Esq., Tea Planter, Maple Cottage, Darjeeling,—proposed by W. H. Cogswell, Esq., seconded by G. L. Kemp, Esq.

P. Donildson, Esq., Superintendent of Jail, Buxar,—proposed by Dr. S. Lynch, seconded by the Secretary.

CONTRIBUTIONS.

- From Ernst Benary—Album Benary, Nos. 1 to 6.
From Secretary—Transactions Asiatic Society, Japan, Vol. X., Part I.
From Editor—*Tropical Agriculturist*, 1st June 1882.
From Government of India—Report of the Census of Berar 1881.
From Government of India—Administration Report of the Jails of Bengal 1881.
From Superintendent—Memoirs of the Geological Survey of India, Ser. X., Vol. II.
From Baboo P. C. Bannerjea—A general collection of Timber seed.
From Dr. George King—Three pots of *Broussonetia papyrifera*.
From W. S. Cresswell, Esq.,—A collection of Golden Ferns.
From J. W. Holderness, Esq., Officiating Under-Secretary to the Government of India—extract from the *Dundee Advertiser* regarding the utilization of Flax Stalks for paper-making purposes.

As paper manufacturing in India is assuming more importance, the extract from the *Dundee Advertiser*, alluded to above, regarding the utilization of Flax Stalks in the manufacture of paper, may be read with much interest. (See Correspondence and Selections.)

From J. Binning, Esq.—Seeds of *Victoria Regia*, a portion of these have been planted in the west tank of the Society's Garden at Alipore, the remainder being divided between the Royal Botanical Gardens, Seebpore and the Eden Gardens, Calcutta.

1. Read a letter from Mr. A. H. Shircore, Punjab, soliciting information relative to the purchase of a cheap and suitable Tobacco hand-pressing machine, enquiring where one could be purchased and its probable cost.

2. Read a letter from Secretary, Eurasian and Anglo-Indian Association, returning thanks for papers on the cultivation of Cotton, by Eurasians, and intimating that the same was not likely to be sufficiently remunerative employment for the class referred to.

3. Read a letter from the Secretary, Bengal Chamber of Commerce, acknowledging with cordial thanks, report by W. H. Cogswell, Esq., on samples of Khea fibre, submitted to the Chamber of Commerce, and stating that a copy of the report had been forwarded to the Government of Bengal.

4. Read a letter from Lieut.-Col. Berkeley, Port Blair, applying for Tobacco seed. The Secretary intimated that the application for acclimatized seed had been fully met, but that the imported seed not being in sufficient quantity, he was able to furnish a small portion only.

5. The President laid on the Table a list of Native Noblemen, Chiefs and landed Proprietors, numbering in all 80, who were in no way associated with the Society, and to whom he had addressed the following letter, dated 28th July 1882:—

(In thus giving publicity to it in the monthly proceedings, he said he was very hopeful that many more of the Hindu and Mahomedan Community would be

induced to become members, and that the Press would lend its powerful aid in furthering the objects of the Society.)

On behalf of the Agricultural and Horticultural Society of India, I have pleasure in forwarding herewith the last published journal of the Society with a copy of its rules.

From a perusal of these it will be seen what are its objects, the extensive and varied field of its labors, and the successful working of the Institution over a lengthened period of sixty-two years, under the special and distinguished recognition of successive Governors and Viceroys of India, as its Patron.

The important position which the Society has always held may be gleaned from the fact, that the Government of India recognized the great and beneficial work which was deeply and earnestly engaging its attention, by making over a portion of ground in the Royal Botanical Gardens, for the prosecution of its labors, and also by allowing the Society a special grant of five thousand Rupees a year which was continued until the close of 1871, when the requirements of Government necessitated the Society vacating the land, and in consideration thereof, and in lieu of the annual allowance, it received a free grant of its present Garden of sixty beegahs, adjoining the residence of H. H. the Lieutenant-Governor of Bengal at Alipore. From the Bengal Government the Society still receives a special grant of Rs. 2,400 per annum.

Since the Society was founded in 1820, it has imparted great benefits to this country, through the instrumentality of its members, by the diffusion of much knowledge and experience in the several branches of Agricultural and Horticultural pursuits. The same policy which the eminent founder of the Society advocated, has guided its actions throughout, and been the mainspring of its great success hitherto.

It is my wish that no efforts should be relaxed, but rather increased, to push on in an ever enquiring course, in investigating, in solving difficulties, and in arriving at the best and most scientific methods that should be employed in such pursuits.

That can best be done by combination, by exchange of ideas, of practices, and of customs.

So pregnant with meaning, so full of sound, clear sense and judgment, are the words of its founder, the Rev. Dr. W. Carey, that I feel I must quote them, *viz.* —

“A body of men engaged in the same pursuits forms a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all.”

Therein lies success in all such undertakings, particularly in pursuits of this nature; to originate and develop, to systematize and reduce to simple practice, much that lies beyond the reach of private persons, who might be influenced by such a body, seeking to inculcate in others a desire and inducement to lead

to a cultivation of kindred tastes, to acquire a knowledge and to achieve success in utilising all the resources of land, skill and labor, and to reduce to a pleasurable, profitable pursuit, what might otherwise be an arduous, costly task."

Such then is my great desire to make known the objects of this Society, hopeful that the example put forth by the body of men who initiated the great work, by their strenuous labors, which they and their successors in office have continued to exercise in fostering the Institution, and conducting it to such a successful issue, by their example and encouragement, which have led to widespread tastes in the development and improvement of Agriculture and Horticulture, that these and many similar cogent reasons may be the means of inducing Your Highness to become a Life Member, or Ordinary Member, and thereby not only assist this Society in furthering its functions by your valuable aid, by your powerful influence, experience and advice, but to receive in return what may add to the prosperity of those immediately in your own province, confer great blessings upon them and the country, in materially aiding the progress of that which has the attention of most thinking men, particularly the landed proprietors, namely, the Agriculture and Horticulture of India.

Trusting to have the pleasure of receiving a favorable reply to this.

I have the honor to be,
Your Highness's obedient Servant,
W. H. COGSWELL,
President,
Agricultural and Horticultural Society of India.

Wednesday, the 30th August 1882.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. J. M. Sherman, H. Bell, H. J. F. Freeman, and P. Donaldson.

The names of the following gentlemen were submitted as desirous of joining the Society:—

J. M. Zorab, Esq., Civil Surgeon, Balasore,—proposed by the Secretary, seconded by H. J. Leitch, Esq.

Managers, Tarrapore Tea Co., Dewan Division, Thaalu Division, and Labac Division,—proposed by the Secretary, seconded by W. Stalkartt, Esq.

M. O. Bell Irving, Esq., Merchant, Calcutta,—proposed by W. H. Cogswell, Esq., seconded by W. Pigott, Esq.

CONTRIBUTIONS.

From Government of India—Records of Geological Survey of India, Vol. XV., Part III., 1882.

- From Government of India—*Indian Forester* for July 1882.
- From Government of India—Report of the Alipore Reformatory School.
- From Government of India—Review of Forest Administration 1880-81.
- From Secretary—Report of the Committee, Bengal Chamber of Commerce, for half-year ending June 1882.
- From Secretary—Journal of the Asiatic Society of Bengal, Vol. LI., Part II., No. 1, 1882.
- From Secretary—Proceedings of the Asiatic Society of Bengal, Nos. V. and VI., for May and June 1882.
- From Editor—*Planter's Gazette and Commercial News*, London, April 15th 1882.
- From Editor—*Tropical Agriculturist*, Colombo, Ceylon, August 1st 1882.
- From Superintendent—A small bag of Havannah tobacco seed from Botanical Garden, Jamaica.
- From W. Adamson, Melbourne—Several varieties of seeds of useful Australian trees.
- From Dr. Menzies—A quantity of Australian seeds.
- From Dr. King—Seeds of Cinchona, Pithecolobium Saman, and 12 pots plants of Broussonetia papyrifera.
- From Superintendent—Seeds of Broussonetia papyrifera, from Botanical Garden, Hong-Kong.
- From Baboo Peary Chand Mittra—50 copies of his work “Agriculture in Bengal with notes by Baboo Joykissen Mookerjee.”
- For the whole of which the best thanks of the Society were accorded.

COMMUNICATIONS.

Read a letter from Mr. H. G. French, of Chacranum, P. O. Khurba, forwarding specimens of Kooch grass and advocating its worth as a suitable article for paper or fibre manufacture.

Read a letter from Lieut.-Col. Woodcock, District Superintendent of Police, Sultanpore, Oude, soliciting designs of European and American agricultural implements, and enquiring if any of the Calcutta Trade can help him in the matter.

Read a letter from D. McMurphy, Esq., Editor, *Indian Agriculturist*, acknowledging with thanks receipt of a packet of seed of Broussonetia papyrifera.

Read a letter from Dr. George King, Superintendent, Royal Botanical Garden, Seepore, applying for good tobacco seed. The Secretary intimated that one quart fresh Virginia tobacco seed had been supplied.

Read a letter from Dr. Menzies relative to a couple cases of plants brought by him from Melbourne as a present to this Society, and intimating the kindly interest Lord Normanby, Governor of Victoria, Australia, and other influential gentlemen in that Colony were taking in the labours of this Society. It was unanimously resolved that a special vote of thanks be given to Dr. Menzies, and

that the Secretary be requested in conveying the same to offer in return, plants from the Society's Nursery for the Colony of Victoria.

Read a letter from Messrs. Oldemeyer and Hardenfeldt of Calcutta, soliciting supply of 50 lbs. of Indian Hemp of the Female Plant, Herba cannabis for purposes of scientific experiment. Resolved that they be referred to the Government of India in the Revenue and Agricultural Department.

CACAO.

Read following communication from Mr. A. H. Blechynden respecting Cacao :—(See body of the Journal.)

GARDEN REPORT FOR AUGUST 1882.

The experiment of importing Achimenes in growth has been fully justified. Last year's importation having rapidly propagated, we may safely enter the same for general issue next rainy season.

Of *Eucalyptus citriodora*, I am glad to say, a number of plants look healthy, and with acclimatized seed from same, we may, I think, be sanguine of establishing the plant as a habitat of Bengal. Several new varieties of Gloxinia and Begonia seed have been imported, and I trust, should success attend germination, to considerably reduce the very high price which these popular plants have hitherto obtained. I am glad to say that satisfactory arrangements have been made for the importation of over 100 new varieties of Geraniums, and I am certain under what is known as open air-layering, i. e. without earth, under incision to meet by next December any ordinary demands there may be from Members and others. I have the pleasure to intimate the arrival of Dr. Menzies from Melbourne, a valued Member of the Society, and a gentleman who has in extensive travels attained solid experience in Flora and Horticulture. The Society has again to thank him for his great kindness in bringing a couple cases of ferns and useful plants collected in Australasia, comprising Aspleniums, Aspidiums, Adiantums, &c., most of which have arrived in good condition, some that look sickly or dead have spores with every appearance of germinative power.

Mr. Maries has kindly arranged for exchange of plants, and from his long and extensive experience as a Botanical Collector of Ferns, Orchids, and Lillies, the Society is sure to benefit by same.

I have also to mention that special arrangements have been made for the collection of Indian Orchids, and it is desirable in the interests of economy that gentlemen needing such plants should intimate their requirements. In the matter of Crotons, I think it is deserving of mention that I despatched 600 plants without any earth whatever, the entire expenses only amounted to Rs 15. and this included the cost of telegram, baskets, cartage and freight per mail train to Saharunpore: the Superintendent of the Botanical Gardens there has intimated that the plants arrived in very good condition.

Wednesday, the 27th September 1882.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members:—

His Highness the Rao of Cutch, Bhooj,—proposed by the President, seconded by the Secretary.

Messrs. J. M. Zorab, M. O. Bell-Irving, and Managers, Tarapore Tea Co., Dewan Division, Thaciu Division, and Labac Division.

The names of the following gentlemen were submitted as desirous of joining the Society.

Dr. J. B. Rudduck, Medical Officer, Mesa, Kelly Den, Assam,—proposed by H. J. Leitch, Esq., seconded by G. L. Kemp, Esq.

F. Wood, Esq., Hattorie Factory, *vid* Bilaspore, Tirhoot State Railway,—proposed by the Secretary, seconded by J. E. MacLachlan, Esq.

J. P. Scotland, Esq., Executive Engineer, Buxar,—proposed by P. Donaldson, Esq., seconded by Dr. S. Lynch.

Baboo Pertab Narain Singh, Deputy Magistrate, Bancoora,—proposed by the Secretary, secouded by H. A. Firth, Esq.

Rejoined—E. J. Shuttleworth, Esq., District Superintendent, Police, Patna.

Read a letter from St. John Kneller, Esq., intimating that His Highness the Maharnajah of Cooch Behar accepted with pleasure the vacant seat on the Society's Council.

CONTRIBUTIONS.

From Dr. Menzies, one box useful Forest seeds from Victoria, Australia.

From C. Nickels, Esq., a quantity of Aster seed.

From Government of India—Report of the Police of the Lower Provinces, Bengal Presidency, 1881.

From Government of India—Annual Statement of the Sea-borne Trade and Navigation, Bengal Presidency, 1881-82.

From Government of India—Report of the Alipore Reformatory for 1881.

From Government of India—*Indian Forester* for July 1882.

From Government of India—Annual Report, 1881-82 of Royal Botanic Gardens, Calcutta.

From Government of India—Paper on introduction of Arracacha into this country.

From Superintendent, Botanic and Afforestation Department, Hong-Kong.

No. 1—Paper on *Cassia Lignea* “*Cinnamomum Cassia Bhime*.”

No. 2—Notes on the vegetation of the West River.

From Secretary—Proceedings of the Agri-Horticultural Society, Madras, 19th July and 9th August 1882.

From Editor—*Tropical Agriculturist* for September 1882.

COMMUNICATIONS.

Read a letter from Deputy Conservator of Forests, Madras, forwarding a list of seeds and soliciting contribution from the Society of such as could be supplied. The Secretary intimated that on application to Dr. George King, that gentleman kindly supplied five packets of seeds, and that the Society had contributed 31 different packets of Australian seeds and one of *Broussonetia papyrifera*.

Read a letter from Dr. Geo. King asking for seeds of *Eucalyptus*. The Secretary intimated that 31 different packets of Australian seeds and one of *Broussonetia papyrifera* had been supplied.

Read a letter from L. A. Bernays, Esq., Houses of Parliament, Brisbane, Queensland, acknowledging with thanks receipt of Atkinson's Notes on the Products of N.-W. Provinces, and intimating that the Society's request of a supply of "*Alsophila Rebeccae*" would be met shortly.

Read a letter from Major Marshall, Superintendent, Chumba State, forwarding specimens of dried hops, *viz.*, English Hops grown at Panji at an elevation of 8,500 feet being above rainfall, these plants are reported to be in their second year of flowering and that profusely. The second specimen of Bavarian or French hops grown in the Ravi Valley at an elevation of 3,300 feet where the rainfall is light, but there are occasional heavy storms. The plants are two years old, with the exception of about 50 which are in their third year. They have had two very trying seasons in Chumba and have done well, and Major Marshall is sanguine that their prosperity is fairly well assured. A further report later on is promised.

Read a letter from Messrs. Begg Dunlop & Co., soliciting information on the cultivation of *Theobroma Cocoa*. The Secretary intimated that the same had been supplied from the Society's Library.

Read a letter from H. G. French, Esq., soliciting information on *Cassia Tora*, *Cassia occidentalis*, and asking for seeds, leaves, or flowers of the same. The Secretary intimated that Mr. French had been informed that the Cassia plant in question was indigenous to this country, the vernacular name being *Cliskoonda*—and his attention was drawn to the *Indian Agriculturist* of 1st Instant, which gives the following report and analysis by Professor Attfield, Ph. D., F.R.S., F.I.C., F.O.S., Professor of Practical Chemistry to the Pharmaceutical Society of Great Britain, Author of a Manual on General Medical and Pharmaceutical Chemistry. "Neither the seeds of the *Cassia occidentalis* nor those of the *Cassia Tora* contain Theine. Neither contain the principle somewhat analogous with Theine, namely, theobromine. Each variety was submitted to two distinct processes, either of which process readily extracts Theine from Coffee, &c., but no trace of Theine was detected, indeed neither variety yields any one of the class of Chemical substances (Alkaloids) to which Theine belongs."

The seeds of *Cassia occidentalis* affords in 100 parts.

Mucilaginous matter, that is soluble gum or Arabic, and in-				
soluble gum or Bassorin with some legumin	"	...	38.3	
Alluloid matter or fibre	...	...	...	30.7
Fat	...	...	...	5.1
Other organic matter, including a little sugar and starch, a				
good deal of reddish-brown colouring matter, and some in-				
soluble albumenoid matter	...	...	...	11.5
Water	...	...	...	9.6
Mineral matter, similar to that of most vegetable substances	...	...	4.9	
				—
			100 parts.	—

A qualitative analysis of the seeds of *Cassia Tora* showed that they resembled in composition the seeds of *Cassia occidentalis*.

The roasted seeds resemble Coffee in odour and in flavour, an infusion of the ground roasted seeds can scarcely be distinguished in taste, aroma or appearance from infusion of Coffee.

The foregoing investigations enables me to give the opinion that *Cassia Tora*, or "Cassoffee" is not analogous to true Coffee, because it does not contain Theine "sometimes termed Caffeine" or any similar principle.

Cassoffee is equivalent to "Fig Coffee," "date Coffee," "Chicory," &c., &c., such substances when torrefied, parched or roasted, have their gum, sugar, starch, &c., converted into dark-brown coloured matters, having a pleasant odour and aroma; indeed, Coffee itself after roasting owes its sensible properties to the same matters.

Theine is practically flavourless.

I am of opinion that the two Cassias cannot be considered in any way injurious to health.

Read a letter from H. C. Sproull, Esq., forwarding extracts from the *Australian* on Pyrethrum as an insecticide and possible cure for Red Spider and Blight in Tea, and soliciting information on Pyrethrum. The Secretary intimated that Pyrethrum and Chrysanthemum were identical plants, and a reference had been made to England for detailed information thereon.

A parcel containing 31 Forest seeds from Victoria, Australia, and one of *Broussonetia papyrifera* have been sent to Mr. C. Nickels, for trial and report in the Jounpore district.

A Model of a Rice Husking Machine as used in the West Indies by Chinese has been constructed under the orders of Mr. W. H. Cogswell from a rough sketch kindly furnished by Mr. H. A. Firth, and it has been determined to give the same a practical trial shortly with a full report thereon, so that its usefulness may be generally made known.

GARDEN REPORT, 27TH SEPTEMBER 1882.

The grounds have been farther cleared of worthless and obsolete plants, the spaces thus thrown open will answer for annual beds, which by the end of February having been by natural course released from that duty, will be utilized for the planting out of the choice Rose plants from England.

Annual seed to a slight extent has been tried and found so far successful, the beds for annuals are now quite ready, and I purpose to-morrow morning planting some out.

Fruit grafts such as Peaches, Lichies, and Mangoes are now ready for distribution, also a good kind of Pineapple from the West Indies.

Our propagation season may be now said to have come to a close, and more time and labour can be bestowed on a general clearing, pruning and dressing up.

I would again, as last year, draw the attention of members to the necessity of taking their supply of Roses in the cold weather, as the plants have then a better chance of establishing themselves than in the rains.

Special and large orders for Bussorah Roses will be registered.

Very good work has been done during the month in distribution of plants and seeds, a quantity of seeds of useful plants as well as flower and vegetable are still available.

A few good showers of rain would fill both tanks, and as the ground is well sodden the loss from percolation should not be very great.

Wednesday, the 29th November 1882.

W. H. COGSWELL, Esq., *President, in the Chair.*

THE Proceedings of the last (September) Meeting were read and confirmed.

The following gentlemen were elected Members :—

Dr. J. B. Rudduck, Messrs. F. Wood and J. P. Scotland, and Baboo Pertab Narain Sing.

The names of the following gentlemen were submitted as desirous of joining the Society :—

E. Brown, Esq., Manager of the Sungma Tea Association, Limited, Darjeeling,—proposed by the Secretary, seconded by H. J. Leitch, Esq.

Manager of Woodlands, Cachar,—proposed by the Secretary, seconded by W. S. Cresswell, Esq.

Alexander Mann, Manager of the Nonai Tea Company, Assam,—proposed by G. U. Yule, Esq., seconded by W. S. Cresswell, Esq.

Manager, Otter Indigo Concern, Tirhoot,—proposed by the Secretary, seconded by R. Blechynden, Esq.

Thomas B. Walton, Esq., Manager, Equitable Coal Company, Limited, Beetarampore,—proposed by the Secretary, seconded by R. Blechynden, Esq.

Major R. Bartholomew, Deputy Commissioner, Jhung,—proposed by F. W. Tytler, Esq., seconded by H. A. Firth, Esq.

Major Duncan G. Pitcher, Cawnpore,—proposed by H. A. Firth, Esq., seconded by the President.

Sheikh Gholaum Moheed-ood-deen, landed Proprietor, Meerut,—proposed by the Secretary, seconded by Rajah Suttyanundo Ghosal.

His Highness the Nawab of Jaora,—proposed by the President, seconded by Rajah Suttyanundo Ghosal.

His Highness the Rajah of Nursinghur, Bhopal,—proposed by the President, seconded by Colonel W. Kincaid, as a Life Member.

Rejoined—G. W. Shillingford, 'Esq., Bogracote, Pillans Hât *via* Silligoree.

CONTRIBUTIONS.

From the Government of Bengal—The Annual Report of the Government Cinchona Plantation in Bengal, for the year 1881-82, and the Annual Report of the Quinologist for 1881-82.

From the Government of Bengal—Report on the Administration of the Registration Department in Bengal, for the year 1881-82.

From the Smithsonian Institution—The Annual Report for 1880.

From the Editor—The *Tropical Agriculturist* for October and November 1882.

From the Editor—Journal of the North China Branch of the Royal Asiatic Society for 1882.

From the Secretary—Journal of the Asiatic Society of Bengal, Part 1 of No. 11, 1882.

Proceedings of the Agri-Horticultural Society of Madras of 6th September 1882.

From Dr. George Kipp—Superintendent, Royal Botanic Garden, presenting ten plants of *Musa textilis*, for experimental cultivation in the Society's Garden.

JAPAN PEA.

Letter from the Government of India with papers regarding the Japan Pea and Chiua Bean, the Soy Bean, alluded to in the proceedings of a meeting of this Society, held on the 2nd September 1881, as also Resolution thereon to the effect that the Government think it desirable that the cultivation of this Pea should be extended in this country, and stating that a fresh supply of seed will be procured from Japan, in order that further experiments may be tried.

BEE-KEEPING.

Letter from the Government of Bengal on the subject of Bee-keeping in India, and enquiring whether the Society can afford permission to Mr. Douglas, who has brought out some Hives, to keep them in the Society's grounds at Alipore.

A reply has been sent that the Society will be happy to meet this request, and to afford Mr. Douglas every assistance in their power.

ALOE FIBRE EXTRACTOR.

Letter from the Government of Bengal, dated 18th November, intimating with reference to a previous communication of the 25th August 1861, that a model of the "Mexican Aloe Fibre Extractor" has been despatched to the Government of India, and that the model will be forwarded to this Society on receipt.

Letter from Mr. H. Prestoe, Director of the Botanic Garden at Trinidad, dated 26th September, accepting the Society's offer for an exchange of plants and seeds. Advises the despatch of a case of West Indian plants, and hopes shortly to send some roots of the *Arrachaca edulis* in regard to which he writes as follows:—

"I have to obtain them from some hilly district on the main. It is very rarely brought over here as a vegetable. Indeed in Venezuela where it is collected it does not receive much attention."

SORGHUM.

Letter from Major Pitcher Assistant Director, Department, Agriculture and Commerce, N.-W. Provinces and Oudh, dated 9th November, forwarding sample of *goor* manufactured at the Cawnpore Experimental Farm from amber colored Sorgho; also specimen of Pulp prepared at the Lucknow Paper Mills from the refuse of the stalks, and soliciting opinion on these samples.

The following report kindly prepared by Mr. W. H. Cogswell, with reference to the above was submitted to the meeting:—

"The samples above referred to are worthy of consideration, both being products of some value, if properly and carefully prepared."

The plant is well known, Sorgho or Sorghum, the seed of which yields a hard food-grain, capable of being ground into good white flour. It is also used for cattle feeding purposes, the green fodder of the plant being highly nutritious and sweet.

The sample of *goor* said to have been prepared from the expressed juice of this plant is very soft, pasty, sticky, and devoid of all granulation. In its present hard dry condition it would be saleable in the bazar at about Rs. 2-8 to Rs. 3 a bazar maund, but if subjected to a damp atmosphere or kept during the rainy season, it would quite change its character and become dissolved in the form of molasses, in which state it would be suitable for distilling into spirit only, and be worth about Re. 1 to Re. 1-8 a bazar maund.

I am however of opinion that with care and cleanliness in boiling the expressed juice and better manipulation generally, this plant is capable of yielding a good marketable *goor*, that further efforts should be made to improve upon the sample now under consideration, and in doing so that details should be given of the cost of producing it, and that a larger sample be furnished.

The samples of the cane-like stalks after pressing, prepared in the unbleached and bleached state for paper material, are too small, insignificantly so, to admit of a very reliable opinion being given. They would be suitable as short stuff or filling in the "Pulp," at a low price, and as such would make fair raw material for paper manufacturing; but the main questions for consideration are what would be its first cost, then the cost of transport to the consuming market or paper mill, and whether the supply would be constant and to what extent. I submit it would be well in all such reference as this one that large samples should be supplied to enable experts to give reliable opinions, and that full details of cost, &c., should be furnished, so that with such data at hand it might be seen if any good practical results would be the outcome of further investigation and trials. The subject is one of much interest and importance in the increasing demand for paper-making materials with which this country abounds."

GARDEN.

The Superintendent of the Garden reports that the tanks now hold a very good supply of water which will be invaluable in the coming dry season, that the labor force is busily employed in clearing all jungle and generally cleaning up the grounds, now that the pruning is nearly finished, and that the general average of germination of imported seeds promises fair, all things considered, but that he hopes to furnish the usual detailed statement in due course.

Thursday, the 5th January, 1883. [For December 1882.]

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last (November) Meeting were read and confirmed. The following gentlemen were elected Members :—

Managers of the Sungma Tea Association, Darjeeling; of Woodlands, Cachar; of the Nonai Tea Company, Assam; of the Otter Indigo Concern, Tirhoot; and of the Equitable Coal Company, Seetarampore; Major R. Bartholomew; Major Duncan G. Pitcher; Sheikh Gholaum Moheed-ood-deen; His Highness the Nawab of Jaora and His Highness the Rajah of Nursinghur, Bhopal.

The names of the following gentlemen were submitted as desirous of joining the Society :—

F. D. Bellew, Esq., Senior Master Pilot,—proposed by Mr. R. M. Daly, seconded by Mr. J. E. MacLachlan.

S. R. Elson, Esq., Senior Master Pilot,—proposed by Mr. R. M. Daly, seconded by Mr. R. Blechynden.

J. Leadbeater, Esq., Rannikhet,—proposed by the Rajah of Kantil, seconded by the Secretary.

Maharajah of Mohurbunge,—proposed by the President, seconded by Mr. G. L. Kemp.

CONTRIBUTIONS.

1. Suggestions regarding the demarcation and management of the Forests of Kulu. By Dr. Schlich. From the Government of India.
2. Memoirs of the Geological Survey of India,—*Palaeontologia Indica*, Ser. XII, Vol. IV, Part 1, and Ser. XIII. .
Records of Ditto, Vol. XV, Part 4.
Memoirs of Ditto, Vol. XIX, Part 2. From the Government of India.
3. A Manual of the Land and Revenue Systems and Land Tenures of British India. By Baden Powell. From Government of Indin.
4. Proceedings of Asiatic Society of Bengal, July and August 1882. From the Society.
5. Proceedings of Agri-Horticultural Society of Madras, November 1882. From the Society.
6. *Tropical Agriculturist* for December 1882. From the Editor.
7. Field and Garden Crops of the N.-W. Provinces and Oudh, Part 1.
From Government of the N.-W. Provinces,
8. A collection of geranium plants. From Mr. W. Gollam.
9. Two fine plants of *Maguolia grandiflora*. From Mr. C. Nickels.

GAEDEN.

A report from the Garden Committee was submitted. The Committee intimate they have arranged for an Iron Plant House, to be commenced at once. They allude to the recent consignment of Roses from Messrs. Paul and Sons of Cheshunt. Those despatched in Wardian cases had proved a failure ; the larger quantity in closed wooden boxes had succeeded much better.

The usual monthly report from the Superintendent was also submitted, of which the following are extracts :—

"The garden has been further cleared of useless plants, but there is a good deal yet to be done in that way. A new ornamental plant catalogue is being prepared, and will be issued in due course, in the meanwhile members desiring a few, but choice plants in their allowance, may have the same by visiting the garden and making their own selection.

Eucalyptus citriodora has taken very kindly to Bengal, and being sweeter scented than *Aloysia citriodora*, "sweet scented Verbena" besides growing to a good size, ought to make it a very popular plant, and one that no house should be without.

The Potatos kindly supplied the garden by Mr. W. Stalkartt have been planted and look very promising; by next meeting I hope to be able to report fully on them.

The Iron Plant House now in course of erection, will be found very useful for members and others selecting plants, as being massed in lots, a glance will shew what is available.

I shall in the course of a few days send up to Secretary's Office *Reana luxurians* and *Bahmia Cotton* seed; fair supply of the former has been collected, and the latter is being gathered.

The shade thrown by *Oreodoxa regia* has had a peculiar effect on a bed of Rose plants, all within its range having suffered, and to all appearance died down. On removal of the *Oreodoxa regia* the Rose plants recovered their vitality, and I have every reason to believe will do well; this may be worth enquiry as *Oreodoxa regia* does not appear to have a baneful effect on other plants."

RESULTS OF EXPERIMENTAL CULTIVATION OF KUMAON POTATOS IN THE DARJEELING DISTRICT.

Read a letter, dated 8th September, from the Secretary, Government of India, Revenue and Agricultural Department, requesting to be furnished with a report on the above potatos, of which a supply was given in February last. (*See body of the Journal.*)

INTRODUCTION OF CERTAIN FRUIT TREES INTO THE FIJI ISLANDS.

The following interesting letter from JOHN B. THURESTON, Esq., Colonial Secretary at Fiji, dated 10th October was next read:—

I have to acknowledge with many thanks the receipt of your note, dated the 28th June, together with a case of Mangoes and Lichees per ship *Poonah*.

Your communication would have received earlier reply, but for the unusual pressure of my official business, consequent upon the removal of the seat of Government from the Island of Ovalau to that of Viti Leon.

It is with pleasure that I now am able to inform you as to the results of your kind and very valuable donation.

The Lichees with two exceptions, were all alive. They have been planted out in appropriate situations and are in a fair way of establishing themselves.

A few Lichees had been previously introduced by planters returning to the Colony *viz.* Ceylon, but I am not aware that they were established in any one case. The same may be said of Rambutan, Longan, &c.

You are probably aware that a congener of the Lichee, *viz.*, *Nephelium pumatum* is indigenous to Fiji. It is a very fine tree and bears a very agreeable fruit. But you have it, I believe, in many parts of India. [Not in the Society's Garden.]

Of the Mangoes, a fair proportion were alive. Those dead were as noted in the margin. The plants had experienced some very cold weather, and had, I think, suffered a little from the not uncommon mistake of being supplied with too much water. Upon the whole, however, Mr. Cornelius landed his charge in very fair condition and has well earned my thanks.

The names in the margin are most likely improperly spelt. There being much difficulty in reading some of the labels. But may serve to indicate the varieties lost.

In consequence of the early departure of Mr. Cornelius to his post at a somewhat distant part of the Colony, I was unable to consult him as to what plants in this Colony would be acceptable to your Society.

But until he has been here, some little time, it is not likely that he would have upon such a point much advice to offer.

I shall therefore fill your case for return per first January and ship in May next, exercising my own discretion as to its contents, though in the meantime if you can give me any suggestions yourself, it will give me pleasure to act upon them.

This Colony appears to present conditions of soil and climate favourable to the growth of a number of tropical productions, and with the assistance of the older Colonies and Dependencies of the Crown might soon possess them.

Dr. King has very kindly sent me from time to time a number of trees and seeds of economic value and they are doing very well.

With the present rapidity of steam communication, I find, however, that the post is a most useful agent, as by the transmission of fresh seeds the probabilities of a useful introduction are increased, and the risks to individual plants avoided.

If, therefore, it is within the power of your Society to send me seeds of any useful fruit or timber trees, or of any ornamental plants, it will confer a benefit on this young Colony.

I have succeeded in obtaining a grant of land, or rather a reservation, for the purpose of forming nurseries and gardens for the propagation and culture of useful and ornamental plants and trees, the management and control of which I have undertaken myself until such time as the finances of the Colony will permit of a professional officer being appointed.

Sir Joseph Hooker and Mr. T. Dyer have both taken great interest in the task I have set myself, and will learn with pleasure of the valuable and quite unexpected assistance you have been so good as to give me.

Resolved—That the acknowledgments of the Society be tendered to Mr. Thurston for his interesting communication,—that a supply of seeds be forwarded to him, and that his offer of reciprocation be thankfully accepted.

JAPAN PEA.

Read a note from the Superintendent of the Botanic Garden, Saharunpore, forwarding a small paper of the Japan Pea (*Soja hispida*), and promising a larger quantity on receipt of a supply shortly expected from Japan.

The Secretary stated that this pea had been brought to the notice of the Society some 38 years ago, as the following extract from its proceedings for August 1844 will show. A correspondent (Captain Bigge) presenting an assortment of seeds from China, makes the following remarks in regard to one kind, which is doubtless the *Soja hispida* :—

"Of the esculents the large white pea is deserving of this notoriety, that it forms the staple of the trade of Changhair or nearly so, to the astonishing amount of 10 millions of dollars, or 2½ millions sterling. This I give on the

authority of the Rev. Mr. Medhurst, of Chaughair, and Mr. Thom, H. M. Consul at Ningpo. The peas are ground in a mill and then pressed, in a somewhat complicated, though as usual in China, a most efficient press, by means of wedges driven under the outer part of the frame-work with mallets. No description would suffice without a drawing. The oil is used both for eating and burning, more for the latter purpose, however, and the cake packed like large Gloucester cheeses, or small grindstones in circular shape, is distributed throughout China in every direction both as food for pigs and buffaloes, as also for manure."

BEE-KEEPING.

Read the following note from Mr. John Douglas in continuation of the subject introduced at the last meeting :—

I am exceedingly obliged by your letter of the 21st ultimo granting me every facility for cultivating bees at the Society's Nursery Gardeus, Alipore, and I hope to be able to avail myself of the facilities so obligingly offered at an early date.

I am endeavouring to obtain swarms of the large native bees particularly of *Apis dorsata*, I should feel greatly obliged by any assistance towards this object which any member of the Society may be pleased to afford.

I may mention that Apiculturists in Europe are exceedingly anxious to obtain this bee for trial, and I have arranged to send a swarm to the British bee-keeper's Association for trial.

It may interest you to know that of two queens and three swarms of Italian bees, I have succeeded in saving two swarms which are now breeding and one queen.

From Dr. John Anderson, Superintendent, Indian Museum, applying for information regarding the keeping of bees by natives of this country.

The Secretary mentioned he had afforded such information as was possessed by the Society.

PROTECTION FROM WHITE ANTS.

Mr. Marshall Woodrow, Superintendent, Botanical Gardens, Ganesh Khind, Poona, gives the following as an antidote for white ants :—

Perchloride of Mercury, as its name implies, is a compound of Chlorine and Mercury. It is a heavy white crystalline substance soluble in water and very poisonous. It is procurable from any Chemist in a large way of business. This substance has been in use during many years among Botanists and other Naturalists to protect their specimens from insects, and recently has been tried with success against White Ants.

To use the Perchloride of Mercury it should be dissolved in water and the papers to be preserved dipped in the solution. Glass or glazedware Vessels only should be used to keep the solution. As some officers meet with a difficulty in getting this substance, a small quantity has been prepared at this office for distribution; it is packed in small packets, each sufficient for one quart bottle of water, and these packets are enclosed in a paper bearing directions for use and containing one dozen packets.

COMMUNICATIONS ON VARIOUS SUBJECTS.

1. From Captain Pogson furnishing some information in respect to *Pyrethrum* as an insecticide :—

I see by the Proceedings of the Society for September last, that information is desired on the subject of the Pyrethrum, and I trust that given on the other page will suffice. The Pyrethrum is much used as a bedding foliage plant, and does not grow much higher than 18 to 20 inches at Kotegurh. The Chrysanthemum is from 2½ to 4 feet in height at Simla and Kotegurh.

The native name for the plant and flower, is "Gool-Daodee," or Davids rose.

There are five varieties of Pyrethrum, one, two feet high, two of three inches each, and two of six inches each, these four are invaluable for bedding, all four are called "Golden feather," the old name being "Fever Few."

I should say, a solution of carbolic acid, applied through an "Atomizer," or spray producer, would destroy the Red-spider, and anything else in the insects line. It does so in America. Tobacco water may be similarly used.

Pyrethrum Parthenium (Linn). "Common Fever Few."

Flower of disk yellow, of the ray white. July, Perennial.

"The whole plant is bitter and strongly scented, reckoned Tonic, stimulant, and anti-hysteric. It was once a popular remedy in ague; its odour is said to be particularly disagreeable to bees, and that these insects may be easily kept at a distance by carrying a handful of the flower heads."

No. 2. *Pyrethrum Tanacetum*.

"Leaves Stomachic, Cordial, Cephalic, Uterine; seeds Verinifuge."

Flowers not described. (South of Europe) No. 1, grows perfectly in Simla and Kotegurh. The leaves are pale yellow with a greenish tinge. Flowers in July, August. Seeds freely wont answer in the plains. A foliage plant as well.

Chrysanthemum coronarium (Linn). Garden Chrysanthemum. South of Europe.

Flowers used to discuss Steatomatous tumours.

No. 2, C. *Segetum*, (Linn). Corn Chrysanthemum.

Flowers yellow, June to August. Annual, Corn fields.

Discussive and attenuant when used externally; and given against the Jaundice, Asthma, and shortness of breath.

2. From Under-Secretary, Government of India, Revenue and Agricultural Department, enquiring for information in respect to sand-binding plants. Complied with.

3. From the same, forwarding a model of the "Mexican Aloe fibre extractor" referred to in the Proceedings of the last meeting.

4. From Messrs. Balmer, Lawrie & Co., requesting full information in respect to the cultivation of the Aloe plant. Complied with.

5. From J. Clarke, Esq., Melbourne, acknowledging receipt in fair condition of a case of Orchids in exchange for Ferns.

A. H. BLECHYNDEN,
Secretary.

REPORT
OF THE
Agricultural and Horticultural Society
OF
INDIA
FOR 1882.

*Report from the Council at the General Meeting held on the
28th February 1883.*

THE commencement of another year renders it incumbent on the Council to submit a brief *résumé* of the proceedings of the past 12 months.

It may be observed in respect to the internal economy of the Society that the number of members elected and rejoined (62) is less than in 1881; but the resignations (38) are also less, the number removed for non-payment of subscription (22) is less, so also are those (8) who have been removed by death.* Eighteen names have been withdrawn for long absence from the country. These reduce the number to 597 which may be classified as follows:—viz., 28 Life-Members; 21 Honorary, Associate and Corresponding, and 548 nominal paying Members. Of this number 53 are absent from India, and 45 have failed to contribute in 1882; thus reducing the actual effective number of paying members to 450. (The number of native members is less than one-sixth of the entire list.)

The following is a classified list of members. Of these 110

* Messrs. A. W. Hurle, S. U. Phipps, W. Smith, M. G. Stewart, W. P. Davis, Dr. R. F. Thompson, Rajah Roop Deo of Ali-Bajpore, and the Maharajah Kishen Chand Bhunge of Mourbhunge.

are resident in Calcutta, 411 in other parts of India, and 76 in Europe :—

CLASSIFICATION.	In 60 previous years.	In 1881.	In 1882.	Gross Total.	Total real number at the close of 1882, after deducting lapses.
Honorary Members ...	28	1	.....	29	11
Associate ..	6	.....	.....	6	2
Corresponding ..	16	.....	1	16	8
Civilians, Covenanted and Uncovenanted ...	804	9	3	816	61
MERCHANTS AND TRADERS...	701	16	8	725	84
Agriculturists ...	906	15	22	943	200
Military Officers ...	732	7	3	742	32
Medical ...	281	2	3	286	21
Asiatics ...	402	15	12	429	94
Clergy ...	42	2	.....	44	4
Law Officers ...	151	1,	.....	152	11
Miscellaneous, Police, Civil Engineers, &c. ...	260	21	10	291	69
TOTAL ...	4,328	89	62	4,479	597

The usual statement of receipts and expenditure in a detailed form is appended. From this, it will be seen, that the cost for seeds imported from foreign countries is rather less than usual, and the expenditure for the garden is not so large, namely, Rs. 10,570 against Rs. 11,070 ; the receipts are, however, considerably less, Rs. 5,310 against Rs. 9,885 ; but as mentioned below, 1881 may be considered an exceptional year. In the expenditure above noted is not included certain liabilities (Rs. 1,575) for importation of Roses and rare plants and for heavy repair to the roads. The cash balance in the Bank of Bengal is Rs. 2,509 and arrears for subscription, &c., are Rs. 1,838 making a total of Rs. 4,347. On the other hand there are liabilities to the extent of Rs. 3,773. Of the balance of arrears of 1879-80, namely, Rs. 1,797, the sum of Rs. 183 has been removed from the books as irrecoverable, and Rs. 1,415 have been realized during 1882, the arrears of 1882 amount to Rs. 1,639.

The usual Annual Flower Show was held on the 3rd February, and was equally as successful as that of the previous year, indeed more so in one respect, as the quality of the plants submitted, especially of handsome foliaged ones was superior, to any

previous Exhibition. The number of visitors (1,500) was beyond the average. The space allotted to each class of plants being extended, admitted of a better arrangement than previously: more time was also allowed for the introduction of specimens. The sum of Rs. 414 was awarded from the general fund besides Rs. 67 from the sum of Rs. 100 placed at the disposal of the Judges by the President.

Garden.—The stock of fruit grafts, especially of certain kinds most in demand, has been much increased during the past year, which will admit of a much larger distribution than formerly; it is anticipated that the supply will prove fully equal to the demand. This remark is also applicable to Roses, a class of plants for which the demand greatly exceeds that of any other kinds. Some of the newest varieties have been recently introduced which will be in course of distribution during 1883-84,

Much time and labor have recently been devoted towards a general clearing up of the garden and the removal of several large trees and shrubs, of which there were many specimens occupying a large space of ground which has been better utilized by Rose and other plants much in demand. The majority of these trees were introduced ten years ago to fill up vacant spaces on the formation of the garden.

The distribution of plants is not equal to last year which indeed may be considered an exceptional year: but it has not fallen short of previous years. Rather more than ten thousand ornamental plants have been issued to members and the public, besides certain economic plants and cuttings; of fruit grafts two thousand five hundred have been sent out. A good many plants have also been granted in exchange and to hospitals and asylums.

Several subjects have engaged attention, especially those relative to cotton, fibres, and the introduction of superior kinds of potatos. These matters and many others having been introduced into the monthly proceedings need not be reproduced here, except to notify the fact that in July last the President prepared a full and carefully worded circular letter which was sent to as many as eighty native noblemen, chiefs and landed proprietors, throughout the country together with a copy of the last published number of the Journal. The Council have to notify, with much regret, that as yet three only have responded to the suggestion that their names should be enrolled on the list of members. The Council regret to have to reiterate the fact that while education is rapidly spreading throughout India, the large body of intelligent Hindoo and Mahomedans have not, with very few exceptions, shewn that interest in the proceedings of the Society which might naturally be expected from a class who would

derive the most benefit. The Council would also be glad if the European members would endeavour to induce their friends to join, so as to fill up the gap annually caused by deaths, resignations, and departures from the country. It has been more than once observed in previous reports that if each member would undertake to add one friend annually to the list, that list would soon be doubled. The Council would, in conclusion, bring this fact again to the notice of members in town and country and urge their hearty co-operation.

*Statement of Receipts and Disbursements of the AGRICULTURAL AND
HORTICULTURAL SOCIETY OF INDIA, from 1st January to 31st
December 1882.*

RECEIPTS.

From Members, subscriptions collected during the year	... ... ..	.....	14,478	14	6
" Proceeds of country vegetable, acclimatized flower and other seeds	... ... ..	714	8	0	
" Proceeds of surplus stock of American, English, and German vegetable, French and German flower seeds, and Melbourne field seeds, &c.	... ... ..	2,690	8	0	
" Government—Proceeds of English vegetable and flower seeds, &c., specially imported for H. M.'s Soldiers' Gardens	... ... ..	3,405	0	0	
" Proceeds of copies of Journals of the Society	20	8	0		
" Proceeds of copies of other publications of the Society	... ... ..	6	8	0	
" Proceeds of admission tickets for non-Members to the flower Show held in February	428	0	0		
" Donation from President for special prizes...	67	0	0		
" Cooky hire for arranging exhibitors plants...	25	0	0		
" Amount of freight, repaid	... ... ..	520	0	0	
" Amount of suspense account in deposit for appropriation on various accounts	... ... ..	531	0	0	
" Amount of packing and forwarding charges on seeds, plants, &c.	... ... ..	69	0	0	
" Garden—Proceeds of Fruit Grafts	... ... ..	1,997	12	9	
" Proceeds of ornamental plants	2,011	9	0		
" Proceeds of ornamental plants	2,447	14	0		
" Proceeds of boxes, pots, and Wardian Cases	... ... ..	4,459	7	0	
Amount of cartage and packing of plants, &c., &c.	... ... ..	471	9	0	
Amount of cartage and packing of plants, &c., &c.	... ... ..	379	0	9	
Total ordinary receipts, Rs.	... ... ..	5,810	0	9	
EXTRAORDINARY RECEIPTS.					
From Government of Bengal—Donation from December 1881 to November 1882	... ... ..	2,400	0	0	
" H. E. the Viceroy's annual subscription	... ... ..	250	0	0	
		2,650	0	0	

From Government of Bengal—Donation from December 1881

" to November 1882

" H. E. the Viceroy's annual

subscription

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Brought forward	2,650	0	0	27,213	12	0
From Rent of large room of the Hall from December 1881 to November 1882.	1,200	0	0				
" Rent of stable and coach-house from December 1881 to November 1882 ...	168	0	0				
	1,368	0	0				
	4,018	0	0				
Total Receipts, Rs. ...	31,231	12	0				
Balance in the Bank of Bengal on 31st December 1881 ...	2,843	8	0				
GRAND TOTAL, RS. ...	34,074	15	0				

DISBURSEMENTS.

By Mr. Robert Buist, Junior, for balance of consignments of seeds received in 1881 and in part for 1882 ...	... ..	3,058	7	4
" Messrs. Sutton & Sons for ditto ditto for account of the Society	1,846	7	6	
And in full for ditto ditto imported for Government ...	697	4	8	
	2,043	12	2	
" Mr. E. Benary in part for consignment of seeds received in 1882 ...	1,213	4	3	
" Messrs. Watson and Scull for charges on Benary's seeds ...	101	4	1	
" Messrs. Vilmorin Andrieux & Co., in full for consignment of flower seeds received from France, 1882 ...	1,066	5	1	
" Messrs. Platz and Sons in full for consignment of flower seeds received from Germany, 1882	560	4	7	
" Mr. W. Adamson in full for consignment of field seeds from Australia received in 1882	280	14	0	
" Sundry parties for country vegetable seeds, &c. ...	351	9	0	
" Freight and charges paid on seeds imported for Government ...	21	6	0	
	8,097	2	6	

LIBRARY ACCOUNT.

" Messrs. H. S. King & Co., for sundry publications ...	... ..	111	6	0
" Duftry for binding books ...	... ..	1	0	0
	112	6	0	

PRINTING ACCOUNT.

" Printing money receipts, Annual Reports, letters of call, &c., &c.	72	9	6
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FURNITURE ACCOUNT.

" Repairing office clock	9	0	0
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ESTABLISHMENT ACCOUNT.

" Office Establishment from December 1881 to November 1882	8,859	0	0
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Carried over ... Rs. 17,750 2 0

Report of the Agricultural

Brought forward	17,750	2	0
ADVERTISEMENT ACCOUNT.				
By Advertising notices of meetings, seeds for distribution, surplus seeds for sale, &c., &c. ...	.....	114	3	0
„ Freight paid on packages of seeds, plants, &c., sent to Members ...	.....	568	5	0
METCALFE ACCOUNT.				
„ Proportion of house rates from October 1881 to September 1882 and police, lighting, and water rates from January to December 1882 ...	... 540	0	0	
„ Sundry petty works to the building ...	... 9 4	0		
		549	4	0
STATIONERY ACCOUNT.				
By Stationery purchased	43	3	0	
REFUND ACCOUNT.				
Amount refunded, balance of Account due to Members	19	0	0	
JOURNAL ACCOUNT.				
Messrs. T. Black & Co., for printing 600 copies of Journal Vol. VI, Part IV ...	467	4	0	
Messrs. T. Black & Co, for printing extra copies of notes on Tussur Cocoons ...	14	8	0	
	481	12	0	
FLOWER SHOW ACCOUNT.				
By Prizes distributed to mallies for exhibiting flowers	477	0	0	
„ Advertising, printing, carriage hire, fee for band, hire of tents, refreshment for Judges and Band and sundry expenses incurred ...	431	10	0	
„ Manufacturing a Silver Medal and engraving inscription for award of prize ...	21	12	0	
	930	6	0	
AGRICULTURAL MODEL ACCOUNT.				
By cost and charges on models of water lifts received from Yokohama, a Rice-husking machine made, and repairing sundry old models	115	12	9	
PETTY CHARGES ACCOUNT.				
„ Postage on letters, circulars, journals, &c., &c., and receipt stamps	154	10	3	
„ Punkawallahs, carriage, boat and cooly hire, landing and forwarding charges, cost of wax cloth, oil cloth, twine, &c., &c. ...	318	10	6	
	473	4	9	
	21,045	5	3	
GARDEN ACCOUNT.				
„ Cost of sundry materials for propagation of roses, fruit grafts, orchids, &c., including cost for repairing plant houses and making a new shed ...	366	7	6	

Brought forward ...	366	7	6	.....	21,045	5	3
By Cost of tools, implements, carriage, &c., of plants and contingencies, including new mats to House ...	503	6	0				
,, Assessment on Garden House and Service Tax	169	0	0				
,, Cost of boxes purchased ...	257	12	0				
,, Ditto pots ditto	204	5	6				
	462	1	6				
				-----	1,500	15	0
,, Salary of Head Gardener, from December 1881 to November 1882 ...	2,160	0	0				
And his commission on Garden Sales ...	332	5	6				
	2,492	5	6				
,, Wages of Native Establishment, mullies, coolies, from December 1881 to November 1882	4,149	5	3				
	8,142	9	9				

PLANT ACCOUNT.

,, Mr. W. Bull for consignments of plants ...	1,478	14	7.				
,, W. Paul & Sons Rose plants ...	599	1	0				
,, Sundry parties for fruit seedlings, Crotons, Rose plants, &c., &c., including charges for freight, &c., on plants from different places ...	299	6	9				
	2,377	6	4				
				-----	10,520	0	1
Total Expenditure, Rs. ...	31,565	5	4				
Balance in the Bank of Bengal on 31st December 1882 ...	2,509	9	8				
GRAND TOTAL, Rs. ...	34,074	10	0				

MEMORANDUM.

Monthly Proceedings of the Society.

Thursday, the 1st March 1883.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last (January) Meeting were read and commended.

The following gentlemen were elected Members:—

Messrs. F. D. Bellew, S. R. Elson, J. Leadbeater, and the Maharajah of Mohurbunge.

The names of the following gentlemen were submitted as desirous of joining the Society:—

D. M. Morrison Esq., Merchant, Calcutta,—proposed by Mr. W. H. Cogswell, seconded by Mr. S. H. Robinson.

Munshi Maula Lall, Zamindar, Munsif of Mirzapore,—proposed by the Rajah of Kurtiil, seconded by the Secretary.

Major E. C. Corbyu, Deputy Commissioner, Shahpore District, Punjab,—proposed by the Secretary, seconded by Mr. J. E. MacLachlan.

Major F. R. Lewis, n. a., Calcutta,—proposed by the President, seconded by the Secretary.

M. R. Waller, Merchant, Calcutta,—proposed by Mr. S. Creswell, seconded by Mr. R. Blechynder.

Miss DeMomet, Doctorab ea Garden, Darjeeling,—proposed by Mr. John Stalkartt, seconded by Rajah A. Ghosal.

Mr. D. J. Zain, Calcutta,—proposed by Dr. G. R. Ferris, seconded by the Secretary.

Mr. H. J. Joakin, Merchant, Calcutta,—proposed by Dr. Ferris, seconded by the Secretary.

Rejoined—Dr. G. R. Ferris, Calcutta; Mr. R. J. Carberry, Calcutta; Mr. A. G. Watson, Mr. L. M. Francis, and the Proprietors of the Jugdispore Estate, Beheea.

ANNUAL REPORT.

The Report for 1882 from the Council as read. The Report first enters into details connected with the internal economy of the Society (shewing that the number of Native Members is less than one-sixth of the entire list,) and its financial operations, and closes with notice of flower show, garden, &c.

The following are extracts on these latter topics:—

Vide—Journal Vol. VII, Part I. New Series.

At the conclusion of the reading of the Report the President addressed the meeting as follows:—

Gentlemen,—I feel that the Annual Report for last year, just read, embraces so much and deals so fully with the affairs of the Society, that very little is left for me in the way of comment thereon, but there are a few points, on which I wish to touch as briefly as possible.

The Report alludes to the efforts we have made, to induce some of the large number of native noblemen, and wealthy, influential landed proprietors, to join our Society.

It is shewn that there were eighty of them addressed, and that out of that large number, three only have responded favourably to our representations.

Surprise only at such a result does not convey my feeling, which is also one of great regret that such indifference characterizes those who should be foremost in fostering a Society, whose aim and object are the furtherance of Landholders' interests, in the improvement of their estates, by a higher and better cultivation of their land, by the use of well selected seeds, and as a natural result, a better and larger yield of crops, and a richer harvest to themselves and to their tenants.

It is doubly disappointing when we think that among such gentlemen there is no lack of leisure, means, and ability, and doubtless in many cases, the taste and application needful to devote to such objects, with successful results; and although I am at a loss to understand such apathy, I still look to that wealthy community with a feeling of confidence that amongst their fixed resident ranks, many may be yet influenced to join us and take an active part in the great and good work, initiated and prosecuted with zeal by a few, whose good example should be followed, for they have comparatively but a passing interest in this country, whilst those to whom I allude are in their native land, and with every inducement to come forward and take an active part.

This is in the more necessary, for socially, a great change has taken place. The European has become more than ever a bird of passage than formerly. With some exceptions, men are less public spirited and have less time at their disposal. The battle of life is greater, competition is keen, and they have less time to give for the benefit of public Institutions, but independently of these facts there is certainly much less public spirit generally, and not that inclination to devote a portion of what is taken from the country, for the benefit of the country. This, I think, holds good with few exceptions, among the higher classes of the official community, who draw so largely from the State. The more rapid communication with Europe has no doubt greatly contributed to this state of things. In former years a young man entering the services of Government commenced life under the impression that he would probably have to work for a certain length of time in the country undisturbed, and that he should give a portion of such time, independently of official work, towards the benefit of those among whom his lot was cast. This feeling was shared by many military men in civil and political employ, as well as by civilians generally; now, the object

appears to be to endeavour to accumulate wealth and to retire on as early a date as possible, and all our public Institutions suffer, more or less, from this state of things; hence the greater necessity for the native wealthy landed proprietors, and others to come forward and take their place and stand in our ranks, and become interested in such work as would redound to their own credit, and whilst forwarding their own interests they would benefit their country at large.

The Society's records are flooded with valuable information, and bear testimony to the great benefits this country has derived from its labors and influence, during the past half century: records of good work done which cannot be forgotten, and requiring only the support and encouragement of those to whom I have alluded as an additional reform, or adaptation, to meet the new times and enable the society to increase, in the number of its adherents, in its wealth, and in its great influence, and for the accomplishment of which I appeal to all those who have its interests at heart to continue unflagging their efforts to further its prosperity.

With these observations I have pleasure in proposing the adoption of the Report.

The Report was unanimously adopted, and the best thanks of the meeting were voted to the President for his interesting and appropriate remarks.

The election of Officers and Council was next entered on with the following results:—

President.—Mr. W. H. Cogswell.

Vice-Presidents.—Rajah Suttyanundo Ghosal Bahadoor, Mr. W. Stalkartt, Mr. H. A. Firth, and Baboo Protapa Chundra Ghosa.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. J. E. MacLachlan, Mr. R. Blechynden, Dr. G. King, Dr. S. Lynch, Baboo Peary Chand Mittra, Mr. S. Creswell, Maharajah of Cooch Behar, Mr. G. L. Kemp, Mr. S. H. Robinson, Baboo Joykissen Mookerjee, Mr. John Martin, and Mr. D. Cruickshank.

HORTI-FLORICULTURAL EXHIBITION.

The Reports of the Judges on the annual show of vegetables, fruits, and flowers, were submitted, as follows:—

(Judges, Dr. S. Lynch, Mr. W. Stalkartt, and Mr. John Lynam.)

Horticultural.—The exhibits for which prizes were offered on this occasion, was on a comparatively limited scale, on account of the limited space at disposal, not more than 14 kinds of vegetables, and twelve of fruits. The quantity in each basket was also limited. Notwithstanding the announcement being widely notified to the intending competitors, many baskets contained more than the prescribed number, and several other kinds not in the list, (notably Cauliflowers, Turnips, Knole-kole and Cabbages) were introduced into the tent. Though some of them were well grown specimens, the Judges were not in a position to award prizes to them. However, in some instances, they did not think it desirable to adhere strictly to the rules laid down as to the number of each kind, this being the first attempt, under the new system, of restriction in quantity.

Among the vegetables, there was a marked improvement in Celery. Carrots and Potatoes were also well represented, and Artichokes (out of season). Tomatos and Beet were excellent. Peas and French Beans were fairly good.

In the list of fruits, Bael shewed well; there were some good specimens of Pine Apples, Papyas, and Guavas—though out of season. A special prize was awarded for a small China Orange tree laden with fruit.

Altogether the show was satisfactory, fifty market gardeners competed and fully 350 baskets where shewn. Prizes were awarded to 24, amounting to Rs. 160, of which Rs. 99 were for vegetables and Rs. 61 for fruits.

Floricultural.—(Judges, Dr. G. King, Messrs. G. L. Kemp, H. A. Firth, and Rajah Suttyanundo Ghosal Bahadoor.)

The collection of plants was rather less than last year, but the quality of those exhibited, was equally good, and in some instances better. The competition was much the same—18 gardens, of whom 14 gained prizes. There was a good collection of handsome foliage plants, notably Crotons, Dieffenbachias, Dracænas, Marantas, Anthurium, Aralias, Begonias, including several new kinds. The collection of cut flowers, especially Roses, was excellent—far superior to last year. One collection of Roses from the garden of Mr. G. A. Forbes at Barrack-pore, deserves special mention, but no prize could be awarded to it as it was sent too late. Among the annuals were good examples of Asters, Pansies, Violets, and Verbenas.

The Royal Botanic Garden contributed a very interesting and much larger collection than last year, occupying seven stands, of three tiers each and 9½ feet in length. Of many fine plants the following may be mentioned as among the newer, namely, Piper magnificum, Anthurium Warocqueanum, Dieffenbachia marmorata, D. Purlatorei, D. maculosa, D. Brazilienis, Aralia Veitchii, A. elegantiissima, Selaginella magnifica, S. paradoxa, Dracæna Benthami, Pholidendron Carderi, Heliconia aureo-striata, Phyllagathis rotundifolia, Lindsaya pectinata, Sphaerostemma marmorata, Allomorphia Griffithii, Dichorisandra musaica, Trenesia moluccana, Ptychosperma Singaporesis, Schismatoglottis longispatha, and Centraselenia aurea.

There were three competitors for the "Grant Silver Medal," for the best collection of plants or flowers, of any number of kinds. The Medal was awarded to Baboo S. P. Chatterjee.

Extra prize to the value of Rs. 51, were awarded from the sum (Rs. 100) placed again by the President at disposal of the Judges, for rare or well grown plants not included in the schedule, and Rs. 411 were awarded for the latter. A detailed list is hereto annexed.

The attendance of visitors was less than last year, attributable probably to its not being a public holiday.

Their Excellencies the Viceroy and the Marchioness of Ripon, and His Honor the Lieutenant-Governor and Mrs. Rivers Thompson, honored the show with their presence.

The thanks of the Society are due to Colonel McNair, and the officers of the 4th Regiment N. I., for the services of their Band on the occasion.

A Report from the Garden Committee was introduced and adopted in respect to provision of vegetable, flower, and agricultural seeds for next season from Europe, America and Australia.

MAIZE OR INDIAN CORN.

The Secretary submitted a few notes which he had prepared in connection with some cobs or ears of Indian corn, which had been recently sent down from Tirhoot :— *Vide Journal; Vol. VII, Part I. New Series P. 92.*

RESULT OF TRIAL OF KIDNEY POTATOS IN THE NURSERY GARDEN WITH POTATOS RAISED IN AMERICA FROM ENGLISH STOCK.

A report from the Garden Superintendent (dated 20th February) was read, in respect to the culture of certain potatos presented in November last, by Mr. W. Stalkartt.

"The receipt of, and planting out of these potatos has already been reported on. The supply presented in a small box, was too far advanced towards germination to admit of weighing or the least rough handling ; but for practical purposes it may be correctly considered the presentation weighed four seers. The space occupied by the potatos in the box having been refilled with fresh gathered potatos and weighed. The result being four seers.

I am sending up a small quantity of earth to show the soil the same was grown in, which is not too stiff, reasonably light and friable. The potatos were planted out entire uncut, as in that state I considered them less susceptible to mildew, rot, and attacks of ants, a handful of old well rotted cowdung being placed round the tubers. In the course of three weeks the vines having well developed, were earthed up, an additional handful of similar manure being supplied. Watering was continued from date of planting pretty freely, till the beginning of this month (February), when the supply was gradually lessened, my main object being to avoid the possibility of the vines flowering. A couple of days since I observed red ants, and unearthing found the mischief to the potatos had begun. All the potatos were unearthed yesterday, and the following is the result :—

Sent to Secretary's office on 19th February 1883... 1 seer good potatos.

"	"	"	20th	"	"	... 18½ "	"	"
"	"	"	"	"	"	... 1½ "	small	"
"	"	"	"	"	"	... 4½	,, attacked by red ants.	"

The vines had not withered when the potatos were gathered, but I could not defer the same, owing to the red ants ; I should much wish to plant out similar quantity early in October next, which I think would be the most favorable time for experiment.

Many of the tubers are as large as those put down. I boiled a couple and found them of good color and flavor."

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Mr. Stalkartt shewed some fine specimens of potatos raised in his garden from the above and other kinds.

Mr. West exhibited some well grown seedling tuberous rooted *Begonias* in full flower.

Mr. Maries sent down from the Durbangah Raj garden some fine cut flowers of pansies, pinks and stock.

AMERICAN SUMACH.

The Secretary called the attention of Members to the subject of American Sumach or Divi-divi (*Cæsalpinia coriaria*) in connection with a small quantity of seeds recently gathered from a few trees in the Society's garden, and to the enquiries now being made in respect to this valuable plant. He submitted a paper he had drawn up shewing what the Society had done in the matter nearly forty years ago, and brought to notice certain skins tanned by the pods, and specimen of the pod itself, all which had been in the Museum during this long period. He had prepared this paper to show that the Society had been the first in the field not only in respect to this, but many other useful products, which are now and again introduced as novelties to public notice.

The paper was transferred for publication in the number of the Journal now in the press. (Vol. VII, Part I. New Series. p. 56.)

MUDDAR PLANT.

The Secretary submitted another paper, on the Muddar plant (*Calotropis Hamiltonii*) and its useful properties, and laid on the table specimens from the Museum of cloth made therefrom some 30 years ago. In the proceedings of the Society there occur several notices regarding this jungly plant which may not be generally known or are now lost sight of. Considering it might be worth while to re-introduce the facts notified so long since, for the information of readers of the present day, he had drawn up a few notes thereon. (Transferred for Journal Vol. VII. Part I.)

Wednesday, the 21st March 1883.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the Annual General Meeting were read and confirmed.
The following were elected Members:—

Munshi Mado Lall, Major E. C. Corbyn, Major F. R. Lowis, R. A., Miss De Momet, Messrs. D. M. Morrison, R. R. Waller, D. J. Zemin and H. J. Joakin.

Mr. C. A. White, Assistant Engineer, P. W. D., Hazareebagh,—was proposed as a Member by the Secretary, seconded by Mr. J. E. MacLachlan.

CONTRIBUTIONS.

1. Administration of Bengal, 1881-82, and Report on its external trade for 1881-82. From the Government of Bengal.

2. Report on Government Botanical Gardens of Saharunpore and Mussoorie. From the Superintendent.
3. Monthly Meetings of the Agricultural and Horticultural Society of Madras for December 1882, January and February 1883. From the Society.
4. Report of the Queensland Acclimatization Society for 1880 and 1881. From the Society.
5. The *Indian Forester*, Parts 3 and 4 of Vol. 8, Nos. 1, 2 and 3 of Vol. 9. From the Editor.
6. *Tropical Agriculturist* for January and February 1883. From the Editors.
7. Report on Kew Gardens for 1881. From the Director.
8. Journal of the Asiatic Society of Bengal, Part 1, Nos. 3 and 4; Part II Nos. 2, 3 and 4 for 1882, and Proceedings for December 1882. From the Society.
9. Memoirs of the Geological Survey of India, Vol. 19, Part 3, and of *Palaeontologia Indica*, Ser. XIV, Vols. 1-3. From the Superintendent.
10. Report of Chamber of Commerce for half-year ended 31st October 1882. From the Secretary.
11. Calcutta Exhibition of Indian Art Manufactures 1882. From the Committee.
12. Journal of the Bombay Branch R. A. Society, No. 11, Vol. 15. From the Society.
13. Four kinds of Palm seeds. From the Director, Royal Botanic Garden, Mauritius.
14. A quantity of cuttings of the Aloo Bokhara and Vines. From Superintendent, Botanic Garden, Saharunpore.
15. A quantity of Bean seeds from Mr. John Stalkartt.

The President having announced a valuable donation to the garden from Mr. W. Stalkartt of two fine large plants of *Araucaria Cookii*, the best thanks of the Society were voted to that gentleman for this acceptable contribution. They have been planted out near the principal entrance gate.

APRICOT OIL.

Captain Banon, 39th Native Infantry, submits a specimen of oil extracted from the kernel of the apricot of the north of India and request an opinion as to quality and value.

Messrs. R. Scott Thomson reports on this specimen, "as a good pure oil and may be used for all the purposes for which ordinary almond oil is at present employed. We have tested it to 10° Farenheit at which point it does not congeal which would make it suitable for lubricating fine mechanical works. There would be scarcely any demand for it in this country, but no doubt if it could be landed in England at 9d. per lb. it would meet ready sale. The actual value of it as an article of commerce can only be ascertained by sending a trial shipment of it to England."

GARO HILLS COTTON.

Read a letter from Under-Secretary Government of India, Agricultural Department, requesting to be informed if the Society can furnish any further information regarding Cotton from Chittagong and the Garo Hills. The Secretary mentioned that all the information possessed by the Society had been introduced in the proceedings of last year.

The following is a note now furnished by the Government in continuation of the subject :—

The Revenue and Agricultural Department received lately from the Chief Commissioner of Assam, samples of a class of cotton which is grown in the Garo and Chittagong hill tracts. Quantities of the staple were sent for opinion to the Empress Mills at Nagpore, to the Elgin Mills, Muir Mills, and Woollen Mills at Cawnpore, to the Egerton Woollen Mills at Amritsar, to the Indian Carpet Manufacture Company at Allahabad, and to the Agri-Horticultural Society at Calcutta.

The opinions received are unanimous in declaring the cotton unsuitable for spinning purposes by itself, because of the shortness of the fibres and their hard unpliant nature, which gives them the tendency to separate themselves from each other instead of uniting together on receiving twist. The staple is said to resemble in almost all respects the Nagpore *jherry*, or what is in the Berars called *bilaëti* cotton; but it seems to be more regular in length and slightly stronger. The introduction of seed of this cotton into the Central Provinces is deprecated by the Manager of the Empress Mills, who some time ago also brought objections against the Nagpore *jherry*.

The cotton does not, however, seem to be altogether useless. It is valued, and highly so, for mixing with certain classes of wools from its hard, harsh and crisp fibre; and in fact is said in some respects to more resemble wool than cotton. For carpet making too, the Indian Carpet Manufacturing Company of Allahabad approves of it, and asserts that it is a superior commodity and would be valuable for the finer kinds of stair and carpet cloths. The cotton has already attracted attention in commercial quarters and an export trade has sprung up. The Deputy Commissioner of the Garo Hills district (Captain H. St. P. Maxwell) reports that roughly the amount of cotton exported annually from that district, is not less than 40,000 maunds when cleaned. The official returns of trade on the other hand show that 85,306 maunds of cotton are exported from Chittagong via Narainganj. The Agri-Horticultural Society reports that the staple is already being extensively used in the manufacture of Saxon woollen fabrics on the continent of Europe.

The wholesale price of the cotton in the Garo Hills district varies from Rs. 10 to 17 a maund according to the season of export and trade demand. The price in Calcutta varies between Rs. 18 and 19 a maund.

Waste land is very abundant in the Garo and Chittagong Hills districts, and Captain Maxwell reports—referring to his figure of export (40,000 maunds) that treble that quantity of cotton could be grown by the Garos if a ready market was available.

A few years ago an attempt was made to induce the hill men to remove the seed prior to packing the cotton for sale, and for this purpose a large number of simple machinery were imported from Calcutta and distributed among them, but the movement met with no success. Captain Maxwell who mentions the fact, explains—

"I have noticed, however, that a Garo is susceptible to improvement when the change carries with it a pecuniary advantage; and I have no doubt that if the value of cleaned cotton at the local markets makes it worth while for the Garo grower to produce it in this state, he will do so. The lack of enterprise is not so much with the Garo as with the first purchaser of the plains, who generally is too apathetic and indolent to enter into a vigorous trade."

He adds:—

"If an inducement is held out to export the cotton from these hills in a cleaned state, I will take every measure to see that the advantages to be thus obtained are carefully made known to the interested parties."

A demand seems to exist in Australia for just this sort of cotton for mixing purposes. A sample of it sent by the Revenue and Agricultural Department to a firm in Melbourne was reported on by it as splendidly suited to their purpose "if cleanliness is kept up to sample." The first cost, however, was considered rather high, for, to the price then ruling, riz., Rs. 19 per bazar maund in Calcutta, was to be added rate of freight to Melbourne. More recently a fall in price occurred, and the firm availed themselves of the opportunity to send an order to Chittagong for a small trial consignment. The result is not known yet.

AMERICAN SUMACH.

Read the following letter from Colonel J. Stewart, R. A., Superintendent, Harness and Saddlery Factory, Cawnpore, in reference to the Divi-Divi:—

Having seen in the proceedings of your Society published in the *Pioneer* of 15th Instant, a mention of "American Sumach" or "Divi-Divi" *Cesalpinia corriaria* as a useful plant for tanning leather, I beg to inform you that I have successfully reared the plant for the last 20 years in Cawnpore where the grounds of the Factory of which I have charge are covered with plantations of it.

I originally got the seed in 1862, from Bangalore where the Officers of the Madras Artillery had plantations of it for use in their Regimental Tannery. Subsequently more seed was procured from the Botanical Gardens at Calcutta and the plant has thriven very well here, though the seedlings require great care and cultivation for the first few years.

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The frost of the cold weather in these Provinces is injurious to the young seedlings, and protection is required for them. Field rats are great enemies of the growth of the plant.

I have distributed seeds from Cawnpore to several applicants for them, and am prepared to distribute more if required.

The Secretary intimated that he had requested from Colonel Stewart as full information as he could kindly afford of the ages of his trees, the quantity of pods obtainable from each, and the weight required for tanning leathers of certain kind in comparison with native tans, &c., &c. He had also applied for seed to meet a probable steady demand now that the value of the Divi-Divi was becoming more generally known.

In connection with the above a note was introduced from Mr. S. S. Jones, c. s., Divisional Officer, Deogur, sending a few particulars from the Forest Officer, of the Sontal Pergunnahs. Mr. Jones has likewise promised a quantity of seed.

Also an application from the Executive Engineer of the Bramini Division, Cuttack, for seed of Divi-Divi for trial on the canal banks. (Complied with.)

JAPAN PEA.

The Secretary submitted the following note from Captain Pogson in respect to the Japan Pea sent to him (and to some other correspondents) in the early part of last year:—

The seeds of Japan Pea received by me in February 1882, were partly distributed to several gentlemen at this station (Dehra). The seeds germinated, and I was subsequently informed that all the plants died off during the hot weather. At Mussoorie, some seeds of this Pea, sown in a friend's garden, germinated, grew to the height of two feet, flowered, and bore two Pea pods, at the joints of each twig. These pods were just like the pods of the Urhurdall (*Cajanus Sativa*) the leaves were very like those of the "Moth" dali, only round at the end, instead of pointed.

I suspect the Japan Pea seed sent to the Society was not the variety so highly spoken of in America. I enclose a Photo : of the Japan Pea as produced in Mr. Gregory's seed farm, and think it would be a good plan for you to send him the Photo ; and ask to be supplied with the seed of that particular Japan Pea. In the *Indian Agriculturist* for December 1882, pages 454-455, there is a very interesting paper on the subject of this Pea, of which it seems there are four kinds, viz. "The yellow; brown; round black, and long black." The pea sent me is of the usual Pea color, which makes five varieties.

It would be advisable to obtain some of each kind, to be packed in tin before shipment.

Information as to time of sowing in Japan should be asked for.

As regards seed from Mr. Gregory. If despatched so as to reach Calcutta in August, they would be in growers hands to sow as soon as the rains ceased, which would be by the 10th to 15th of September.

I came down from Mussoorie on the 26th October and in November made two sowings of Japan Pea seed putting 3 seeds in each dibble but as the seed rotted, it was clear that germinating powers had been destroyed. I kept the seed in a well corked bottle, locked in a box so no damp could have got to them. November was a very warm month, and as all common Pea seed came up the failure of the Japan Pea could only be due to death of seed.

I think the Pea answered at Simla but have not heard.

JAPAN SINGLE BULLOCK PLOUGH AND DRY RICE.

Captain Pogson sends the following notice regarding the above plough, and Japan dry rice :—

"It appears that the Japanese possess a plough which is worked by a single bullock. It would be I think advisable to secure one of these ploughs as a model, as I think with suitable alteration such a plough would suit for camel ploughing, four camels can draw a 9-pounder brass cannon and limber with a mounted man per Camel. One Camel easily draws a park Phaeton up hill, from Kalka to Solun on the Simla road, at a trot. Then why should not one Camel draw a Japan single bullock plough, made on an enlarged scale, just as well as two bullocks do the common Indian plough?

In Japan two varieties of Rice are cultivated, wet rice on the low lands, under irrigation and "dry rice" on high lands, and mountain or hill slopes, without any irrigation whatever.

If this dry rice suited the Monghyr, Rajmehal, and Beerbhoom hills, the result would be most beneficial, and greatly increase the rice supply of the country. This rice was brought to notice by a British Consul at Japan, but I cannot lay my hands on the paper, any how no difficulty exists as to securing a supply of seed rice of this variety. But it should be packed in tin otherwise the sea air will kill the seeds. I am pretty certain that the dry rice of Japan, would suit the Himalayas north of Umballa, and so on to Kangra, which already produces any large quantities of wet Rice. It would be sound policy to introduce this dry rice, into such parts of the Afghan frontier where wet rice is now cultivated. The Government of India might if asked help in this matter." Referred to Government of India.

MEXICAN ALOE FIBRE EXTRACTOR.

Read a letter from Under-Secretary Government of India, Agricultural Department returning the model of the Mexican Aloe Fibre Extractor; (See proceedings of November and January last,) and forwarding a working machine $\frac{2}{3}$ ths of the size.

Mr. T. F. Peppé, of Arrah, in allusion to the above machine writes as follows :—

"I am anxious to know something of the machine for cleaning *Agave* fibre which I understand is now in Calcutta and want to know what it costs, and if

it does the work required thoroughly or only partially? I have been experimenting in the matter of fibres in connection with a Tea estate and have therefore seen that a machine such as they use at the Mauritius is urgently required both for *Agave* and *Fourcroya* fibres. I saw samples of the latter fibre at home valued at £46 per ton, and as the plant flourishes in Chota Nagpore I don't see why it cannot be produced on a large scale. If you can assist me in regard to the preparation of *Agave* or *Fourcroya* fibre I will be much obliged.

The Secretary mentioned that he had informed Mr. Peppé that the above machine was available for another to be made from it, and that he might obtain some useful practical information on the subject generally from the Superintendent of the Hazareebagh Jail.

COMMUNICATIONS ON VARIOUS SUBJECTS.

The following papers were also submitted:—

1. From C. F. Mauson, Esq., Dooinka, a paper on the Mohwa, its useful properties, &c. Transferred for Journal Vol. VII Part I.
2. From the Under-Secretary Government of Bengal, a Note on wheat mildew. (Transferred for Journal.)
3. From E. H. Man, Esq., Port Blair, intimating in reply to enquiry, that the quantity of Tea Seed forwarded in the cold season of 1882, through the Society's Agency, has germinated well and the young plants are all healthy and progressing satisfactorily.
4. From W. Lee, Esq., Ramghur Tea Garden, *via* Naini Tal, reporting the failure of the Japan potatos presented by Mr. H. A. Firth. (See meeting of April 1881.)
5. From the Executive Engineer, Bramini and Byturni Division, Cuttack, applying for a quantity of nuts of *Arecia Catechu* with full instructions as to cultivation, probable yield, &c., &c. Seed partially supplied and information given. More seed to be supplied next season.
6. From Under-Secretary Government of India, forwards copy of a letter from the British Consul at Manilla respecting model of a "Manilla Hemp Extractor." "With regard to Hemp Extractors," writes Mr. Wilkinson—"I found on enquiry that none can be had here, and the province of Manilla itself produces no hemp, but I have written to Albay, which is the centre of a large hemp district, in order to obtain the required model which, if sent to me, I will at once forward to the Agricultural and Horticultural Society as desired."

Thursday, the 19th April 1883.

W. H. COGSWELL, ESQ., *President, in the Chair.*

THE Proceedings of the last meeting of 21st March, were read and confirmed.

Mr. C. A. White, Assistant Engineer, P. W. D., Hazareebagh, was elected a Member.

The names of the following gentlemen were submitted as desirous of joining the Society.

H. J. Haynes, Esq., Manager, Jatookea Garden of the Meleng Estate, Assam,—proposed by Mr. J. F. W. Smart, seconded by the Secretary.

R. B. Yates, Esq., Deputy Conservator and Harbour Master,—proposed by Mr. G. L. Kemp, seconded by the President.

A. Campbell, Esq., Assistant Conservator of Forests, Gorruckpore,—proposed by Mr. F. W. Tytler, seconded by the Secretary.

Dr. J. Mullane, Civil Surgeon of Dhubri,—proposed by Dr. Z. A. Ahmed, seconded by Mr. J. E. MacLachlan.

Manager, Moonee Tea Estate, Darjeeling,—proposed by the Secretary, seconded by Mr. MacLachlan.

Captain J. G. Morris, Cantonment Magistrate, Saugor, C. P.,—proposed by the President, seconded by Mr. R. Blechynden.

W. L. Thomas, Esq., Merchant, Calcutta,—proposed by the President, seconded by Mr. R. Blechynden.

Rejoined—Col. J. Stewart, R. A., Cawnpore.

CONTRIBUTIONS.

1. Memoirs of the Geological Survey of India (*Palaeontologia Indica.*) Ser. X Vol. 2, Part 4. From the Director.

2. The *Tropical Agriculturist* for March and April. From the Editor.

3. Proceedings of the Asiatic Society of Bengal, January 1883. From the Society.

4. The *Indian Forester*, No. 4 of Vol. IX. From the Editor.

5. Six large bags of Divi-Divi. From S. Jones, Esq.

6. Ten pounds of Divi-Divi seed. From Col. J. Stewart.

7. Sundry specimens of Maize from Ajmere. From A. Parsons, Esq.

8. Five cobs of Maize raised in Purneah from American seed obtained from the Society. From R. C. Walker, Esq.

Some of these have maintained their character, but others have degenerated.

9. Seed of the "Early Amber Cane." From Capt. J. F. Pogson.

10. A large quantity of acclimatized flower seeds. From Col. H. R. Wintle.

11. Several capsules of Mahogany seed. From D. Cochrane, Esq. These seeds are gathered from a tree in the garden of the late Mr. John Marshman at Serampore. There are several trees in the garden, but one only appears to be a seed-bearer, and that not every year. This year the tree has been laden with fruit. It is an old tree planted, probably, at the commencement of this century by the Rev. Dr. Marshman.

12. A large quantity of Palm seeds of four kinds from the Royal Botanic Garden, Mauritius. Presented by the Director.

The President announced that in accordance with the resolutions passed at Meetings held on the 22nd February and 21st March last, the Council had

authorized certain changes being made in the Executive of the Society. That in consideration of his long and valuable services, extending over a period of 47 years, they had sanctioned a retiring allowance to Mr. A. H. Blechynden, who, however, will still hold office as Secretary, acting on behalf of the Society in England in all matters requiring attention. That of the candidates they had appointed Mr. R. Blechynden, Junior, (who had considerable Mofussil experience) to be Deputy Secretary, to conduct all office duties, and to be in charge of the garden (which latter has been vacated by the resignation of the former Superintendent.) The services of an experienced native propagator for the garden have also been engaged. These arrangements, which take effect from the 15th April, will not entail any additional expenditure.

GARDEN.

A report from the Garden Committee was read. The object of the meeting was to inspect the garden and see to its general condition on the Deputy Secretary taking charge, and to instruct him generally as to its future working. The Committee then state the work to be done in certain portions of the garden which had been neglected and other work to be undertaken. The Committee add that the plant house has been completed in a good, substantial and satisfactory manner and at the moderate cost of Rs. 1,520. The dimensions are 60 feet by 60 feet, and it is tolerably well filled with plants.

AMERICAN SUMACH.

Submitted the following letter from Colonel J. Stewart, B. A., Superintendent Harness and Saddlery Factory, Cawnpore, regarding the Divi-Divi, in response to certain enquiries:—

In answer to your letter of 19th ultimo I beg to say that the pods of the Divi-Divi contain a very large proportion of tannin, far too large for it to be used alone for tanning of leather. The Divi-Divi therefore is used only as an auxiliary in tanning, and is very effective when mixed with Babool bark or other tannages at the rate of from 3 to 5 per cent only.

The Divi-Divi is also used for the finishing of leather in the currying process in lieu of Sumach as the liquor obtained from the pods imparts a good colour to the surface of the leather.

It is best to mix Divi-Divi in the proportion of 3 to 5 per cent with all Tan liquors in a Tannery and thus it is used for tanning all kinds of leather, buffaloe, cow, bullock, goat or sheep skins.

The oldest trees growing in the grounds of the Factory here are 25 feet in height, and they spread out until they cover ground to the diameter of 39 feet.

As much as 30 lbs. of dry pods are collected from each of the old trees. The pods fall to the ground in March or April and are collected and stored, and when required for use are ground to a powder in a Disintegrator Mill.

The older trees continue to produce pods profusely year by year up to the age of 20 years at least, beyond this there is no evidence at present to go by.

The tannin from Divi-Divi is of a very powerful class, but it cannot be said to be superior to any other because only a small proportion can be used and it is only good when used cautiously.

Some trees planted out in 1862 are still in flourishing condition and yielding pods well.

The pods are very curiously twisted and curled up, and there are only a few very small seeds in each pod. The weight of the seeds is very insignificant compared with the weight of the pod.

I have much pleasure in sending you about 10 lbs. of seed and will be able to send any larger quantity you want as the pods are ground down for use. The Divi-Divi is a great success this year. I think we shall gather over 10 tons of pods.

In connection with the above the Secretary read a note from Mr. S. S. Jones, c. s., of Deoghur, forwarding six large bags of Divi-Divi pods from which he had extracted a quantity of seed and sent the balance to Messrs. Monteith & Co., of this city for trial and communication of the result. Mr. Jones writes as follows:—"Can you tell me whether there is any one in Calcutta who would make a remittance of the pods to England? I think I could promise at least half a ton, and should be very glad to know on what terms I could dispose of them. Is there any local demand for them?"

MAIZE OR INDIAN CORN.

Submitted the following correspondence with Mr. A. Parson's Agricultural and Garden Superintendent at Ajmere, in respect to the culture of Maize, exotic and indigenous. (Transferred to Journal.)

THE CHUFAS, CYPERUS ESCULENTUS.

Read extract of a letter from Captain Pogson, suggesting the introduction of the "Chufas" into India:—

I wish to bring to the notice of the Council of the Society, that the "Chufas" or "Cyperus esculentus" grows to perfection in Spain, where the yield varies from 200 to 500 bushels per acre, according to the nature of the soil, and manure used. In America the yield is not so high. But these nuts are in America, reckoned to afford superior fattening food for pigs, and as sheep, cows and oxen would thrive on them as well, their value as food for man and domesticated animals is very considerable. (*vide* Pogson's Manual of Agriculture pages 222 to 225.)

The wine merchants in Calcutta who have correspondents in Spain, might be able to assist the Society, as well as the public in general by arranging to import some tons of these nuts, which I am pretty certain would meet with immediate and profitable sale, and it is possible that the Agricultural Department, would purchase and distribute some of the seed nuts.

The nuts should be sent out packed in casks, chopped straw, or chaff, or a mixture of both, being used as packing material. The cask to be air tight, so as to keep out the sea air.

It would be advisable to obtain information, as to the time of sowing and harvesting these nuts in Spain, and then private enterprise would do the needful.
Early Amber Sorghum. (Transferred to Journal, Vol. VII. Part 2.)

THE CATALPA TREE.

Lastly, Captain Pogson offers some remarks in reference to the "Catalpa tree"—and the desirability of attempting its introduction into India:—

I have enclosed a cutting from the *Tasmanian Mail* of the 10th February 1883, which please submit to the Council of the Agricultural and Horticultural Society, and if approved published in the proceedings, so that steps may be taken by the Forest Department, to introduce this valuable tree into India. The Baron von Mueller will no doubt on your requisition send a supply of seeds, which could be tried by the members of the Society, some information as to climate best suited to the Catalpa tree, should be sent you.

"Our Lands Department, urged by Sir John O'Shannassy says a Victorian paper is proposing to introduce the cultivation of the Catalpa tree. Reports from Baron von Mueller and Mr. Guilfoyle show that these trees are practically imperishable, and are frequently 4½ ft. in diameter. Trees of this wood tested after a century of growth have been found to be perfectly sound, railway rails of it have been used for 48 years without exhibiting wear. Posts 20 years in ground show no decay, and logs lying in swamps, used as bridges for a hundred years, remain unchanged. The wood is light, of a greyish white colour, fine in texture, capable of receiving a brilliant polish, and the bark is tonic stimulant, anti-septic, the honey from the flowers being poisonous. It is recommended for forest glades in sheltered situations, grows 60ft. in height, flowers beautifully, and for mining purposes especially below water, should prove invaluable. About 250 of these trees have been recently grown at Longerong State Nursery, and their acclimatisation will be watched as an event of national importance."

JAPANESE DRY RICE AND SINGLE BULLOCK PLOUGH.

Read the following letter from the Under Secretary Government of India in respect to the above:—

In acknowledging the receipt of your letter of the 27th ultimo, drawing attention to two notices by Captain J. F. Pogson in the proceedings of the Society for March regarding Japanese Dry Rice and Single Bullock Plough. I am directed to state that this Department, will be glad to be furnished with any further information that may be at the disposal of the Society before taking any steps in the direction desired by you. It is not considered expedient to trouble the representatives of Her Majesty's Government in foreign countries with such requisition unless they are clearly shown to be to the public advantage.

Letters are also read from the Assistant Director, Department of Agriculture and Commerce, N. W. P., applying for a quantity of seed of the Minnesota Early Amber variety of *Sorghum* and for seed of the Red Grass of Natal, *Tricholaena rosea*.

The Secretary mentioned that steps had been taken towards meeting both requisitions.

Mr. C. F. Mason, Deputy Collector and Deputy Magistrate of Doomka, forwards a note on the Sâl tree (*Shorea robusta*) of the Sontal Pergunnahs. (Transferred for Journal.)

Wednesday, the 20th June 1883.

W. H. COGSWELL, Esq., President, in the Chair.

The Proceedings of the last meeting held on the 19th April were confirmed. The following gentlemen were elected Ordinary Members...

H. J. Haynes, Esq., Manager, Jatooke Gurdan, Meleng Estate, Assam.

R. B. Yates, Esq., Deputy Conservator and Harbour Master, Calcutta.

A. Campbell, Esq., Assistant Conservator of Forests, Gorakhpur.

Dr. J. Mullane, Civil Surgeon, Dhubri.

Manager, Moonee Tea Estate, Darjeeling.

Captain J. G. Morris, Cantonment Magistrate, Saugor, C. P.

W. L. Thomas, Esq., Merchant, Calcutta.

The names of the following gentlemen were submitted as desirous of joining the Society.

G. E. Manisty, Esq., c. s., Magistrate, Cuttack,—proposed by the President, seconded by Mr. J. E. MacLachlan.

Edward Bigge, Esq., Merchant, Calcutta,—proposed by W. H. Cogswell, Esq., seconded by Mr. R. Blechynden.

Baboo Ishar Prosad Gorga of Moisadal Palace—proposed by Rajah Suttyanundo Ghosal, Bahadoor, seconded by Baboo Jaikissen Mukerjee.

E. W. Read, Esq., Manager, Latakojan Garden, Assam,—proposed by Mr. R. Blechynden, seconded by Mr. J. E. MacLachlan.

Baboo Situlchand Nahar, Azimgungo,—proposed by Baboo Jaikissen Mukerjee, seconded by Rajah Suttyanundo Ghosal, Bahadoor.

Edward J. Lawder, Esq., Private Secretary to the Nawab Vikar-ul-Umra, Hyderabad, Deccan,—proposed by Mr. G. L. Kemp, seconded by the President.

J. D. Maxwell, Esq., Merchant, Calcutta,—proposed by W. H. Cogswell, Esq., seconded by G. L. Kemp, Esq.

E. A. Samuells, Esq., c. s., Magistrate, Bancoora,—proposed by Baboo Pertab Narain Singh, seconded by Rajah Suttyanundo Ghosal, Bahadoor.

W. Bleek, Esq., Imperial German Consul, Calcutta,—proposed by W. H. Cogswell, Esq., seconded by E. Delius, Esq.

R. Deey Spedding, Esq., c. s., Collector, Moradabad, N. W. P.,—proposed by Rajah Suttyanundo Ghosal, Bahadoor, seconded by Baboo Jaikissen Mukerjee.

The Nawab Vikar-ul-Umra, Hyderabad, Deccan,—proposed by Dr. King, seconded by the President.

C. A. Soppitt, Esq., Assistant Superintendent of Police, Cachar,—proposed by W. Aitchison, Esq., seconded by Baboo Jaikissen Mukerjee.

R. Blechynden, Esq., Jr., Calcutta,—proposed by Mr. R. Blechynden, seconded by Mr. J. E. MacLachlan.

Rejoined—A. L. Keith Murray, Esq., Manager, Borpanee Tea Estate, Nowgong, Assam.

Chas. L. Ambler, Esq., Monghyr.

CONTRIBUTIONS.

A selection of seeds from Trinidad, West Indies. Presented by Dr. J. B. Menzies.

A quantity of Mahogany seed. From Baboo Prosono Coomar Bauerjee.

A packet of Broussonetia papyrifera (paper Mulberry). From Dr. King.

A large quantity of acclimatized maize seed. From the Maharajah of Durbhungah.

A bottle of Green Sorrel seed. From Mr. J. Stalkartt.

A Wardian case of plants from Mr. E. Koek of Singapore, (the Secretary was directed to send a suitable selection of plants in the return case.)

A large number of Mahogany seeds from Trinidad. No advice had yet been received regarding these seeds, but they were sown immediately on receipt, Mahogany seeds being so extremely liable to deterioration.

The annual report of administration of the Customs Department in Bengal. From J. Scobell Armstrong, Esq., c. s., Collector of Customs.

Two copies of the Implement and Machinery Review. From the publisher, H. Westcott, '28, Budge Row, London.

The Manual of Agriculture for India, by Lieut. F. Pogson. By the Author.

Department of Agriculture Report for the year 1880. Presented by the Smithsonian Institution.

Proceedings of the Boston Society of Natural History, part of Vol. XX and three parts of Vol. XXI. From the Smithsonian Institution.

The Indian Forester, No. 5, of Vol. IX. From the Editor.

Journal of the Asiatic Society of Bengal, Part I, No. 1 of 1883, Vol. LII and Proceedings for February and March. From the Society.

Systematic Census of Australian Plants, Part I Vasculares by Baron Ferdinand Von Mueller, K. C., M. G., M. D., &c., &c. From the Author.

The Tropical Agriculturist for April and May, (two copies each). From the Editor.

Memoirs of the Boston Society of Natural History Vol. III, Nos. IV and V. From the Society.

Report of the Alipore Reformatory School for the year 1882. From the Superintendent.

Report of the Calcutta Court of Small Causes for the year 1882.

Proceedings of the Agri-Horticultural Society of Bijnoor. From the Secretary.

Proceedings of the Agri-Horticultural Society of Madras Annual Meeting and Ordinary Committee Meeting. From the Secretary.

The Secretary was directed to acknowledge all the above contributions and tender the thanks of the Society to the donors.

COMMUNICATIONS.

Letters, enquiries and communications on various subjects were read.

From Mr. J. Horne, of the Botanical Gardens, Mauritius, to say a Wardian case of selected sugar-cane including "Desiderata," would shortly be sent.

Major D. G. Pitcher, of the Agricultural Department, N. W. P., for a maund of Carolina paddy seed. (To be supplied on arrival from America.)

Mr. E. H. Boileau, Forest Department, Masulipatam, asking for seed of the Rain Tree (*Pithecellobium Saman*). Application complied with.

Chas. P. W. Martin, Esq., Tezapore, Assam, promising a further supply of cane seed from the Duffla Hills.

C. Casperz, Esq., Sub-Divisional Officer, Sasseram, enquiring if the Society can procure seed potatoes for experimental planting in certain Government Mahals. (A reply in the affirmative was sent to Mr. Casperz who was asked to make an application when the season for planting potatoes approaches.)

In connection with this subject Baboo Jaikissen Mookerjee promised a supply of potatoe seed, a very favorable report having been made on samples submitted by him at one of the Society's Meetings.

A letter from J. Binning & Co., enquiring for details of working of the Mexican Aloe Fibre Machine alluded to in the Proceedings of the 21st March last. All the trials up to date not having proved satisfactory; a report is withheld pending further trial.

MOONGAH SILK.

The following letters on this subject were read :—

J. W. Holderness, Esq., Simla, 25th April 1883.—I am directed to forward a copy of a letter from the Political Agent at Baghdad, and its accompaniment, together with the sample of the fibre therein alluded to, and to say that this Department would be glad to be favoured with any information available that would lead to the identification of the plant which yields the fibre in question.

W. Tweedie, Esq., Baghdad, 30th January 1883.—I enclose copy with English translation of a letter in Turkish, just addressed to me by His Excellency Muhammad Hidayat, the Mushir Pasha, or Commander-in-Chief of this Wilayat: asking for a supply of a seed which, as far as can be made out is that of the fibre from which in India, the fibre known as Mugra silk is made.

From His Excellency Muhammad Hidayat Pasha; to H. B. M.'s Officiating Consul General, Bagdad, dated Bagdad, 29th January, 1883.
 * * * *

Translation.—It is understood that a fibre called in this country Shaari, believed to be a species of flax, which is much used in embroidering is produced abundantly in India.

My idea is that the rich soil of this Wilayat would surely produce the article in question if the seed were introduced, which would be the rendering of a service only to be expected from the interest you show in matters of public benefit: and if you will permit me in taking this opportunity of expressing my friendship and regard, to ask you to apply to the Government of India for a supply of the seed in question I shall esteem it a favour.

The following report was furnished by the President:—

It is a difficult thing at all times to form any thing like a reliable opinion on such a very small sample of fibre as the one now referred to, and to be able to state with any degree of accuracy what it really is, or to identify the plant from which the fibre has been produced.

My first impression was that it might be the *Sansevieria Zeylanica*, the moorva fibre Sans. murva or Beng. Moorga and Moorgavee described by Sir Wm. Jones in his Asiatic Researches, the leaves of which plant I send herewith. The same fibre is referred to by Dr. Roxburgh, Dr. Forbes Royle and others in their several works on Indian Fibrous plants, as used for ropes, lines, bow strings and producing a soft fine fibre, resembling silk and capable of being spun and manufactured into cloth.

On comparing the sample, however, with the Moorgah or Moonga, Silk Fibre, some specimens of which from Assam are in the Society's Museum, presented 42 years ago and with a sample kindly placed at the Society's disposal by Dr. McCann, Officiating Secretary of the Economic Museum, they correspond so exactly with the above named Persian sample that I think they are identical. Dr. McCann also drew reference to Balfour's Encyclopædia in which work this silk fibre is spoken of as having been mixed with cotton and manufactured into a fabric at Dacca which was largely exported to Jeddah and Bossorah, and it may be to this that His Excellency Muhammed Hidayat Pasha refers in his letter to the Political Agent at Bagdad.

W. H. COGSWELL.

The Deputy Secretary intimated that an acknowledgment of the above report had been received from Mr. Holderness, Offg. Under-Secretary to the Government of India, who had mentioned that specimens of fibre are being procured from the places mentioned in Mr. Cogswell's note.

A NEW TEA INSECT.

Messrs. Begg, Dunlop and Co., write:—

In continuation of previous correspondence, we have now the pleasure to

hand you per bearer a tin containing a number of the insects received from the Lung Ling Estate, the Manager of which wrote us as follows:—

“I am packing up for despatch to you a large quantity of the new Tea insects in two of their different States. I cannot obtain the moth. I hardly think it is time for it yet.”

The insects were forwarded to Dr. Anderson, of the Indian Museum, who had kindly consented to observe their habits, and who had procured a supply of food suitable for them from Dr. King; any further communication received on the subject will be published in due course.

The attention of the members present was drawn to some very large specimens of Tea leaf from the Dooars forwarded by Mr. F. F. Wyman, Editor of the *Tea Gazette*. In reply to an enquiry as to whether the bushes from which the specimen had been taken were treated in any special manner. Mr. Wyman forwarded the subjoined communication from his correspondent:—

I send you specimens of Tea leaves of this season's growth from the Western Dooars. Several you will see are exceptionally large for the first three leaves and the bud, and will give great weight of a.

Bagracote, 13th May 1883.—Your favour of the 8th instant to hand, I am glad to hear you have received the tea leaves and shoots safely. The leaves and shoots represent the average of the major portion of this garden.

A portion of the tea is eight rising nine years, and a portion seven rising eight years. We have several other blocks just as good, and a few blocks of pure indigenous and extra good hybrid *much better*. As the latter are, however, young bushes, and at the further end of the garden I did not pluck any samples from them. I could from them, I think, send you leaves nine and ten inches long, as the bushes, though young, are very fine for their age. No part of this garden has ever been manured nor have any of the blocks received any special treatment. The growth in the Dooars is really most astonishing. I have never seen such *rapid* growth in Assam.

EURYA SERRATA.

Mr. Wyman also forwarded some leaves for identification.

“I send you also some leaves of a plant very much like those of the Tea plant, for which they are often mistaken.”

Dr. King kindly identified the leaves as those of the Eurya Serrata, which, he remarks, has frequently been mistaken for tea. The Secretary mentioned that he had some years ago seen some “tea” made from the leaf in question which had all the appearance of the genuine article.

RHEA, OR CHINA GRASS SEED.

A letter from Mr. Bleek, Imperial German Consul was read—

I have been requested to procure some pounds of good sound seed of the Rameh (nettle) plant.

Several Agricultural Societies in Germany have vainly tried to procure good healthy plants from seed obtained from France, and are now desirous to make an experiment with the real Indian seed.

I therefore venture to ask whether you will be kind enough to procure the said seed for me, or if this be impossible, would you please inform me where it can be got?

The Secretary mentioned that the seed was difficult to procure, as it is seldom preserved owing to the fact of the plant being much more easily and readily propagated from cuttings and division of roots, and that he was informed by the Superintendent of the Government Botanical Gardens, Saharanpore, that it did not seed there at all, the plants being of one sex, though he had once raised Rhea from seed procured from Java. Efforts are being made to obtain the seed to meet this and other similar applications.

WHEAT AND COTTON.

Samples of these were sent by the Superintendent, Agri-Horticultural Society's Garden, Lahore, on which the following report was given:—

Cotton.—This sample of Kuppas, that is with the seed left in, uncleansed, is most beautiful, the staple is soft, silky, long, strong, and of a clean, white color. It would sell most readily in the home markets if the seed was separated from the fibre, and would realize high prices as compared with the American cottons. It would have to be sent to Europe for the quality is far too good for the local mills in India, whose spinnings are almost entirely on low counts of yarn. It would be interesting to see a sample of this cotton after the seed had been separated from it.

Wheat.—The samples marked C 1, 2, and 3 are not sufficiently marked in character to separate, so must be taken as a whole. They would rank with Allyghur wheat worth about Rs. 2-14 a maund. The grain is good bold and plump, but not so good in color as Meerut wheat, the latter being whitish, whilst the former is yellow, and worth about Rs. 2-15. The samples marked L. G. 1, 2, 3, like the former are not sufficiently marked in character to separate, so I treat them as one sample. The wheat is damaged and spotted with much grain discolored, and would not sell for shipment hence in consequence, but would be bought only by the local retail dealers. It is worth about Rs. 2-8 a maund.

W. H. COGSWELL.

GARDEN.

There is nothing very particular to record under this head, steady progress has been made with the work indicated as more urgent by the Garden Committee. The remains of a shed near the dwelling house has been removed, roads rolled and weeded. The gaps in the wall have been rebuilt and leveling the lawn taken in hand. The propagator whose appointment was confirmed at

the last Meeting has been doing good and satisfactory work, and has now a large stock of Roses which should be ready for distribution at the usual time at the end of the rains.

The new sorts of Achimenies got out last year are looking strong and healthy. The attention of members is drawn to the large stock of Mahogany plants now in hand, upwards of 1,000 being ready for immediate distribution. There are also a large number, about 1,000, seedlings of Arabian coffee available, some young Indian Rubber plants, a few teak, Divi-Divi and a large stock of fruit grafts, mangoe, lichee, and peach, &c. A potting shed for use during the rains is in course of erection from materials most of which are available in the Garden, so the expence will be trifling. Since the last Meeting the garden has been visited by a severe storm which snapped off some twenty feet from the top of the fine young Eucalyptus tree south of the lawn and uprooted one or two other trees but no great damage has been done. There have not been many cash sales, as usual during the hot dry season. The new orchid house is well filled with plants and a large quantity of finely screened ashes were obtained and laid down, giving a firm dry and pleasant flooring. An experimental sowing of early Amber Sugarcane (the seed of which was presented by Captain Pogson and noticed at the last Meeting) resulted in a failure, only a few seeds having germinated. A great quantity of brick rubbish has been collected from various parts of the garden as it rendered digging, &c., difficult and was very unsightly; arrangements are being made to sell this as road metal the proceeds to be used to buy "Kauker" for the garden roads, this will be cheaper than making it into material on the garden.

Rice Husking machine. (Transferred to Journal, Vol. VII, Part II.)

Wednesday, the 25th July, 1883.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last meeting held on the 20th of June, were read and confirmed.

The following gentlemen were elected as Ordinary Members:—

G. E. Manisty, Esq., c. s., Magistrate, Cuttack.

Edward Bigge, Esq., Merchant, Calcutta.

Baboo Ishar Prosad Gorga, of Moisadal.

E. W. Reid, Esq., Manager, Latookajan Garden, Assam.

Baboo Sital Chand Nahar, Azimgunge.

Edward J. Lawder, Esq., Private Secretary to the Nawab Vikar-ul-Umra, Hydrabad, Deccan.

J. D. Maxwell, Esq., Merchant, Calcutta.

E. A. Samuels, Esq., c. s., Magistrate, Bancoorah.

W. Bleek, Esq., Imperial German Consul, Calcutta.

R. Deey Spedding, Esq., c. s., Collector, Moradabad, N. W. P.

The Nawab Vikar-ul-Umra, Hyderabad, Deccan.

C. A. Sappit, Esq., Assistant Superintendent of Police, Cachar.

Richard Blechynden, Junior, Esq., Calcutta.

The names of the following gentlemen were submitted as desirous of joining the Society.

W. Campbell, Esq., Kurhurrie Factory, Tirhoot,—proposed by the Deputy Secretary, seconded by Mr. J. E. MacLachlan.

A. M. Bose, Esq., Barrister-at-Law, Calcutta,—proposed by Rajah Suttyanundo Ghosal, Bahadur, V. P., seconded by Mr. Richard Blechynden, Junior.

J. R. Croft, Esq., Merchant, Calcutta,—proposed by Mr. G. L. Kemp, seconded by Mr. W. Stalkartt.

J. D. Maseyk, Esq., of Jungipore,—proposed by Mr. R. Blechynden, seconded by Mr. G. L. Kemp.

F. A. Dawson, Esq., District Superintendent of Police, Bancoorah,—proposed by Baboo Pertap Narain Singh, seconded by Baboo Joykissen Mookerjee.

Rajah Rajkoomar Rai, of Patariaghata, Calentta,—proposed by the Deputy Secretary, seconded by Rajah Suttyanundo Ghosal, Bahadur, V. P.

G. B. Reynolds, Esq., c. e., Assistant Manager, Weirrora State Railway Colliery,—proposed by Col. W. B. Thomson, seconded by Mr. J. E. MacLachlan.

Prince Mirza Mohamed Jahali, Bahadur,—proposed by Rajah Suttyanundo Ghosal, Bahadur, V. P. seconded by Mr. Richard Blechynden, Junior.

CONTRIBUTIONS.

A large number of Chrysanthemum and Polianthus Roots, and some Begonia cuttings. From Rai Prosono Coomar Banerjee,

Capsicum seeds from General Dhoje Narsingh Rana Bahadur, Nepal.

Capsicum seeds from Masulipatam, a quantity from E. H. Boileau, Esq., Forest Department.

The *Indian Forester*. Nos. 6 and 7 of Vol. IX. From the Editor.

Proceedings of the Asiatic Society of Bengal for April 1883.

The *Tropical Agriculturist* for June and July (two copies each.) From the Editor.

The Records of the Geological Survey of India Vol. XVI., Part II., 1883. From Government of India.

Suggestions regarding Forest Administration in the Madras Presidency. From Government of India.

The Administration Report on the Jails of Bengal 1882. From Government of India.

Album Benary No. 7 and a number of large size Floral Pictures. From Ernst Benary Erfurt.

5 lbs. of Divi-Divi seeds. From Col. J. Stewart, R. A., Cawnpore.

COMMUNICATIONS.

From Major Pitcher, Department of Agriculture, N. W. Provinces :—“You would greatly oblige me if you could kindly find out through your correspondents in the Mauritius the price of the “gretteuse” and of the “Casse-tête” implements in use there for cleaning and extracting Aloe fibre. I should like an estimate of the cost of each landed in Calcutta.” The Secretary said that Major Pitcher’s request had been complied with but there had not been sufficient time to receive a reply. The Casse-tête, is the machine alluded to in late proceedings, the use of which appears to require some practice, but one of the garden men is being, trained to work it so that it may have a fair trial.

From Messrs. Begg, Dunlop & Co.—Asking for information regarding experiments made with American cotton seed in India. As such a mass of information has been collected by the Society in the last thirty years during which experiments have frequently been made, Messrs. Begg, Dunlop & Co. were referred to the Society’s Journals.

RICE HUSKER.

Several applications either for drawings or working-models of the Rice Husker reported on in last proceedings were read, the Deputy Secretary mentioned that these were being prepared.

Information regarding a machine for *cleaning* and whitening rice has also been received and will be duly noticed.

MANILLA HEMP EXTRACTOR.

The following letter received from Mr. Wilkinson, British Consulate, Manilla :—

“I have the honour to inform you that I have sent to the Harbour Master at Hongkong with request to forward to you, a model of a Hemp Extractor as used in these Islands. The model is reduced exactly one-half the usual size. The several pieces of wood which compose it are packed up loose, but they can be easily put together by means of the enclosed instructions and diagrams. I have had much difficulty in procuring this model from one of the provinces of this Island, hence the delay in sending it to you.”

The following is a description of the apparatus in use in the Province of Albay, Island of Luzon, for extracting the fibres from the stalks of the wild plantain (*Musa textilis*) locally known as Abacá, or Manilla hemp.

Two strong uprights are firmly fixed in the ground and connected by a cross bar, in the centre of which a large broad bladed knife is fixed edge downwards on a block of wood fastened lengthwise on the bar, the knife has a strong handle which is connected by a cord to a long bamboo made to act as a spring, by being tied in the middle and the butt, parallel and above the bar, the free end thus forms a supple and powerful spring, and holds the edge of the knife firmly against the block ; below the bar, there is a treadle, attached by a cord to the handle of the knife, the mode of operation is for the worker to stand

opposite the knife, placing either foot on the treadle, which he depresses thus forcing the knife handle down and the blade up, he then places a strip of stalk (called locally *saju*) between the blade and the block, leaving only enough to wrap round a stick, on the near side, he then releases the treadle, and the knife by the action of the bamboo spring, nips the strip firmly against the block, and on the workmen drawing the strip through, the pulp is left behind. The apparatus is extremely simple and inexpensive.

OLIVE IN INDIA.

From Messrs. Begg, Dunlop & Co.—We should feel greatly obliged if you could supply us with some information regarding the cultivation of the Olive in India. * * * * It seems strange that the cultivation of the Olive which has attained to such importance in the country mentioned should be * * * * neglected in India. Any information which you can give, we shall be glad to receive as also particulars as to the best mode of propagation. To which the Secretary replied as follows:—

In reply to yours of the 22nd instant, regarding Olive culture in India, I append an extract from a Report furnished by Dr. Ross in the year 1852, the only experiment to extract oil from the wild Olive, of which I can find any record. This experiment is alluded to by Dr. Stewart in his *Punjab Plants*, published in 1869, and by Dr. Brandis in his *Forest Flora*, published in 1875 as crucial, and as one that proves that oil cannot be extracted in sufficient quantities to make it remunerative. You will observe in Dr. Ross' Report, that the fruit was dried in the sun, and altogether treated in a manner which appears to be quite opposed to the Italian practice, where the fruit is collected into small mounds, and the oil expressed by their own weight, escapes and runs into a receptacle—they are then pressed with small mill stones, and the oil obtained by this method too is of good quality. The fruit is then placed in sacks, boiling water poured over them, and again pressed, the produce being inferior in quality, the oil is then kept in stone jars, and the slimy parts allowed to settle, these dregs must be removed, or the oil would become rancid.

I will lay your letter before the Council, and will submit a proposal to make a careful trial when the season arrives.

As regards modes of propagation. There are three methods mentioned—cuttings which appear to strike readily, “driving a stout stake cut from a branch” into the ground which throws out roots and grows into a tree, and cutting from a felled tree the wood “between the root and the trunk” into pieces about the size of a mushroom taking care that some bark adheres; which pieces are planted, are fit for transplanting in a year, and for removal to the Olive yard in three.

There are a great variety of Olives valued each for special qualities. I shall be happy to obtain advice from France as to the species which are most esteemed. I may add that the European Olive trees imported into Bengal have not as yet flowered.

Mr. Powell, of the Lahore Agricultural and Horticultural Society, in reply to an enquiry regarding the condition of the imported Olive trees tried in Lahore writes that—"the *trees* grew well enough in good soil, and even made a show of flowering but no fruit; fruit of the size of a pin's head may form, but they invariably drop off." Mr. Powell adds, he thinks, Chumba and the upper Sutlej Valley suitable places for the introduction of the European variety. "I have at the Agricultural and Horticultural Garden, Lahore, succeeded in raising native Olive stocks from seed, and grafting the European Olive on them, but though the grafts taken perfectly well; none have been done long enough to test the probability of fruit."

INDIAN WHEAT AND WHAT ITS FUTURE MAY BECOME.

Towards the autumn of 1882, the Secretary of State for India had instituted a series of experiments, by practical experts, in Indian Wheat, thoroughly exhaustive as regards their quantitative and qualitative properties and values, in comparison with those of American and other well known recognized wheats of commerce, and from the analyses of which it is shewn that the Indian Wheats, "afford a larger margin of profit both to the miller and baker than any other." These are such startling facts, they possess so much of interest, not only to members of this Society, but to the public generally, that I feel too great notice and prominence cannot be given to them, so I unhesitatingly give, *in extenso*, the whole of the details of those experiments, the results, and the deductions to be drawn therefrom, as published in "*The Economist*" of 9th June 1883.

That article was preceded by the publication of a pamphlet here in March last, known by some as the "yellow pamphlet," entitled, "Indian Wheat versus American protection, or the influence of English Trade and American protection on the Development of India," so ably dealing with this subject, that the Government of India were furnished with a copy of it, and received a communication thereon from the Bengal Chamber of Commerce.

It shows the position occupied by India as to supplies for Europe, how the trade could be diverted from America to this country, and the advantages to the Indian ryot and to the English manufacturer that would result. There is the following proof of the quality of the wheat raised, proof that it can be raised, and at prices that will place it on fair competitive grounds, and there is ample evidence of the one thing only that is needed to achieve such results, and that is cheap communication by the pushing forward of the Railways and the steady growth of their systems.

I understand that the Government of India are using their endeavours to get a reduction of transit rates on all Indian Railways, that this is likely to be conceded, and if it is, combined with the active competition for Ocean Freight, I know of no valid reason why India should not in time supply the whole of what is called the foreign, or imported, wheat into England, which amounts to

annually about 56 million cwts.; worth 31 millions sterling. Of that quantity about five million cwts., or nearly three millions sterling went from India.

The question of the probable wheat supply from India is occupying the minds of most thinking men of position and influence in England, and I see no good reasons why it should not go forward, but time will be required to develop it to a much greater extent than known at present; with this data, however, before Government, and the adoption of the progressive policy so strongly, yet temperately, earnestly and ably advocated, the results can be but those of Golden Harvests for this country.

W. H. COGSWELL.

EXPERIMENTS WITH INDIAN WHEAT.

In October last Messrs. McDougall Bros., of London, were instructed by the Secretary of State for India to institute a series of experiments with Indian wheat, in order to ascertain how they compared as to yield and quantity of flour with American and other supplies. Conditions under which the experiments were to be conducted are thus set forth by Messrs. McDougall:— *Transferred to Journal.*

GARDEN.

The Garden Committee's Report was read, they intimate that a new Catalogue of Plants is in course of preparation which will be ready at an early date, when a copy will be sent to each member.

The usual Monthly Garden Report was then read.

Since the last meeting good progress has been made in garden work.

A great deal of labour has been taken up in the levelling of the large lawn, however advance has been made, and the work when completed will be a permanent improvement, and will add greatly to the general appearance of the garden and render it more attractive to visitors.

Hoeing and breaking up the ground throughout the orchard has been commenced, a very necessary though troublesome piece of work, which it will take sometime to do thoroughly, as it covers a considerable piece of land.

In the last garden report it was mentioned that a potting-shed was under construction for work during the rains, this has been completed, and has been of great use during the heavy rains we have been experiencing in the month under review.

A bamboo fence some seven feet high to enclose 150' x 75' including the propagating-shed is being made, and will be finished in the course of the month, when the fence is covered with creepers and closed with a door, there will be a good and secure place in which to keep the more valuable plants; the want of which is now greatly felt. The material for this useful work is supplied entirely from the garden.

The few Amber cane which germinated, are now in flower they were sown on the 29th of May, and have thus taken only about sixty days to mature, so

this variety of Sorghum is well named the Early Amber. It is proposed to try another crop of cane in the same land, a report of which will be duly given.

The instructions given by the Garden Committee in reference to collecting plants, near and around the plant house are being carried out, and a road has been commenced which they pointed out as desirable.

A portion of the lane leading into the garden on the eastern side has been widened, and the clearances made round the house formerly allotted to the Gardener, now occupied by the Deputy Secretary, give that side of the garden a more pleasing and ornamental appearance.

Propagation being carried on vigorously, and the stock of plants has thus been largely increased. The following are still available :—

Mahogany, Coffee, Teak, Ceara Rubber, Paper Mulberry, Sago Palms, Poinciana Regia, Livistonia humilis and other Palms.

Flowers have on several occasions been supplied free of charge to many Charitable Institutions on application.

Wednesday, the 29th August 1883.

W. H. COGSWELL, Esq., *President, in the Chair.*

THE Proceedings of the last Meeting held on the 25th July were read and confirmed.

The following gentlemen proposed at the last Meeting, were elected Ordinary Members :—

Mr. W. Campbell, Kurhurrie Factory, Tirhoot.

Mr. A. M. Bose, Barrister-at-Law, Calcutta.

Mr. J. R. Croft, Merchant, Calcutta.

Mr. J. D. Maseyk, of Jungipore.

Mr. F. A. Dawson, District Superintendent of Police, Bancoorah.

Rajah Bajoomar Bai, of Patariaghatta, Calcutta.

Mr. G. B. Reynolds, c. e., Weirrora State Railway Colliery.

Prince Mirza Mahomed Jahali Bahadur.

The names of the following gentlemen were submitted as desirous of joining the Society :—

Mr. M. N. Macleod, Manager, Pipra Factory, Chumparun,—proposed by Mr. M. H. L. Gale, seconded by Mr. W. Stalkartt.

Baboo Radhika Prosad Mookerjee, District Engineer, 24-Pergunnahs,—proposed by Mr. C. C. Stevens, seconded by Rajah Suttynnundo Ghosal Bahadur.

The Manager Rangli Rangliot Tea Company, Darjeeling,—proposed by Mr. G. L. Kemp, seconded by the President.

Mr. C. B. Mackenzie, Gajiliiduba Tea Estate,—proposed by Mr. C. A. N. Wallich, seconded by Mr. J. E. MacLachlan.

Mr. A. Ross, Assistant Sub-Deputy Opium Agent, Shahabad,—proposed by Mr. R. Blechynden, Junior, seconded by Mr. D. Cruickshank.

Rejoined—Mr. J. R. Sandford, Gauhati, Assam.

CONTRIBUTIONS.

Indian Forester, No. 8, Vol. IX. From the Editor.

Proceedings of Asiatic Society of Bengal, for May and June 1883.

Journal of the Asiatic Society of Bengal, Vol. LII, Part I, No. II. 1883.

Tropical Agriculturist, for August (2 copies). From the Editor.

Memoirs of the Geological Survey of India, Vol. II, Ser. X, Nos. XXIII. to XXV. From Government of India.

Suggestions regarding Forest Administration in the Hyderabad Assigned Districts (May.) From Government of India.

Proceedings of the Board of Revenue, Madras, Nos. 1935, 3059, 3182 of 1881; Nos. 1962, 2003, 2360, 2438 of 1882. From Government of India.

Report of the Committee of the Bengal Chamber of Commerce, 30th April 1883. From the Secretary.

Annual Report on the Government Cinchona Plantation in Bengal for 1882-83. From Government of Bengal.

Twenty copies extract from Journal of the Royal Agricultural Society of England 1882, on Wheat Mildew. From Government of Bengal.

Nine copies Note on Castor seed. From Government of India.

Five pounds Khaki Cotton seed. From Captain Morris, Saugor, C. P.

Two cases of Sugar-cane. From the Director, Royal Botanical Garden, Mauritius.

* Some Australian seeds. From G. L. Kemp, Esq.

A case of Pepper (*Piper nigrum*) plants, and some seed, and some Gambier seed. From E. Koek, Esq., Singapore.

Twelve baskets of Ferns. From J. Inglis, Esq., Dilkusha.

Seed of Holly Hock and of six varieties of Cauliflower from the N. W. Provinces. From Mr. G. Bartlett.

In presenting these seeds Mr. Bartlett writes that—"the Holly Hock, an old favorite, has now quite gone out of cultivation in Calcutta" and of the Cauliflower seed, "I send six kinds of acclimatized Cauliflower seed received from the N. W. Provinces. Perhaps you will be so good as to ask for reports of germination and quality of produce, from those to whom you distribute the seed, I never saw any to equal them down here."

COMMUNICATIONS.

Khaki Cotton.

Mr. A. H. Hilderbrand, Akyab, writes as follows:—

"I shall be most happy to get you what you require as soon as the crops now growing in the "jhooms" are harvested say in November or December. I feel

sure that the cultivation of this cotton would be an immense benefit to those who have to supply large bodies of men with Khaki uniform for which it appears to be especially suited. I enclose a sample of some rough cloth I had made last year, out of mere curiosity."

It would not appear, that this cotton is cultivated apart from the ordinary white variety which probably accounts for the sample of cloth sent by Mr. Hilderbrand being somewhat lighter in color than the cotton itself, and even in Shanghai where the well known "Nankin" goods are made from this variety of cotton, the color is apt to "throw back." (Fortunes wandering in China.) No doubt if care were taken with selected seed a good and uniform shade of color might easily be arrived at.

Early amber Sorghum.—(Transferred to Journal.)

PINE-APPLE.

The following information was given by the Deputy Secretary regarding Pine-apple in answer to enquiries thereon :—

(Transferred to Journal.)

GARDEN REPORT, AUGUST 1883.

The levelling of the large lawn alluded to in the last Garden Report has now been finished. Rai Prosono Coomar Bannerjee very kindly gave valuable aid by carefully taking levels and putting down pins; he also put us in the way of obtaining skilled labour, which materially hastened the completion of the work.

The case of Sugar-cane plants, arrived from Mauritius on the 3rd Instant per *Merchantman*, out of the 131 plants sent only 31 have survived, there was some difficulty in getting freight to this port from Mauritius which caused a considerable delay in the despatch of the case, to which fact no doubt a good deal of the mortality may be ascribed. The plants which have survived leave us 18 out of the 34 varieties sent, and if they live they should prove a valuable addition to the varieties now in the country. The work of propagating plants has gone on steadily, and there will be a large stock to draw on for distribution in the cold season, and for the demand that is likely to be made on the Garden when the new Catalogue rates rule.

The following are still available:—

Mahogany, Teak, Tamarind, Ceara Rubber, Poinciana Regia, Paper Mulberry, Pithecellobium Saman, Coffee, Sago Palm, and other Palms, Mango, Peach, and other Fruit Grafts.

Wednesday, the 26th September 1883.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting held on the 29th of August were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members :—

Mr. M. N. McLeod, Pipra Factory, Chumparun.

Baboo Radhika Prosad Mookerjee, District Engineer, 24-Pergunnahs.

The Manager, Rangli-Rangliot Tea Company, Darjeeling.

Mr. C. B. Mackenzie, Gajilliduba Tea Estate.

Mr. A. Ross, Shahabad.

The names of the following gentlemen were submitted as desirous of joining the Society :—

General Azimuddin Khan, Rampore State, *via* Moradabad,—proposed by R. Deey Spedding, Esq., c. s., seconded by Major D. G. Pitcher, b. s. c.

The Manager, Bowreah Company's Cotton Mills, Limited,—proposed by the President, seconded by J. C. Murray, Esq. *

The Manager, Fort Gloster Jute Manufacturing Company, Limited,—proposed by the President, seconded by J. C. Murray, Esq.

Rejoined—Mr. F. Farquharson, Noonmattee Tea Estate, Assam.

CONTRIBUTIONS.

Indian Forester, Vol. IX, No. 9. From the Editor.

Review of the Forest Administration 1881-82. From Government of India.

Memoirs of the Geological Survey of India. Vol. XIX, Part 4, and Series XIII. From Government of India.

Records of the Geological Survey of India, Vol. XVI., Part 3. From Government of India.

Annual Statement of the Sea Borne Trade of the Bengal Presidency 1882-83, Vol. I. From Government of Bengal.

The *Implement and Machinery Review*, Vol. IX., No. 100. From Proprietors.

The Journal of the Royal Asiatic Society, Bombay Branch, No. XLI., Vol. XVI, 1882-83. From the Society.

Report on Indian Wheat by Messrs. McDougall Brothers. From Government of India.

Report of Saharunpore and Mussoorie Botanical Gardens, ending 31st March 1883. From Superintendent Government Press, N. W. Provinces and Oudh.

Aperçu sur La Théorie de L' Evolution, by Dr. Ladislau Netts.

Report of the Council of the Acclimatization Society of Queensland for the year 1882. From the Secretary.

A quantity of Aster Seed, French and China. From C. Nickels, Esq., Jounpore.

About 20 lbs. of Maize Seed, from the Cape per *Rautenberg*, Captain Crudace. From S. R. Elson, Esq.

The thanks of the Society were voted for the above contributions.

COMMUNICATIONS.

Early amber Sorghum. (Transferred to Journal.)

MESEMBRYANTHEMUM CRYSTALLINUM.

From Major S. S. Jacob, dated Jeypore, 1st September:—

In the *Scientific American*, dated 21st July 1883, a notice appears of the above plant, that M. Herve Mangon had observed that it takes up from the soil an extraordinary quantity of alkaline salts, and that he had proposed to employ it for removing excess of salts, from land on the sea coast, and in salty deserts, so as to make the land gradually fit for ordinary vegetation.

I write to ask if you have information about this plant, and if it has not been tried in India, to suggest to the Agri-Horticultural Society, the advisability of getting some of the seed and distributing it for trial in this country, especially in the districts where reh lands occur.

I shall be happy to give it a trial if I can be supplied with some seed.

In his reply to Major Jacob, the Secretary mentioned that the M. Crystallinum is the "Ice-plant" so called, in consequence of every part of the plant being covered with small watery pustules which glisten in the sun like fragments of ice. Large quantities of this plant are collected in the Canaries and burnt, the ashes being sent to Spain for the use of Glass-Makers (Lindley and Moore) Mesembryanthemum Crystallinum in Spain and M. Copticum and Nodiflorum in Egypt, are collected for the purpose of furnishing alkali for glass-works; the former is called Barilla Moradara by the Spaniards, who import large quantities of its ashes from the Canaries, where the seed is eaten as a common food, according to Broussonet (Lindley Vegetable Kingdom.) M. Nodiflorum is used at the Cape in making Morocco leather (Simmonds). Major Jacob's attention was drawn to the "Salsola" plant which has some of the same properties as the Mesembryanthemum.

The Secretary was directed to endeavour to procure some seed of both plants.

Wednesday, the 28th November 1883.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting held on the 26th September 1883, was read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members:—

General Azimuddin Khan, Rampore State *via* Moradabad.

The Manager, Bowreah Cotton Mills Company, "Limited."

The Manager, Fort Gloster Jute Manufacturing Company, "Limited."

The names of the following gentlemen were submitted as desirous of joining the Society:—

Lieut. R. W. Macleod, 29th P. N. I., Agra,—proposed by J. Martin, Esq., seconded by R. Blechynden, Esq.

F. W. Blechynden, Esq., Moorla Factory, Chumparun,—proposed by J. E. MacLachlan, Esq., seconded by G. L. Kemp, Esq.

Captain E. Palmer, Port Officer, Chandbally,—proposed by the President, seconded by Wm. Stalkartt, Esq.

Rejoined—Dr. W. Moir, Meerut.

CONTRIBUTIONS.

Indian Forester, Vol. IX., Nos. 10 and 11. From the Editor.

Proceedings of the Asiatic Society of Bengal, July and August 1883. From the Society.

Journal of the Asiatic Society of Bengal, Vol. LII, Part 2, No. 1, From the Society.

— *Tropical Agriculturist* for August and September, October and November. From the Editor.

Memoirs of the Geological Survey of India, Vol. XXII. From Government of India.

Census of 1881, Statistics of Population, Vol. II. From Government of Bengal.

Statistics of the Population enumerated in the Andamans, 17th February 1881. From Government of Bengal.

Statistics of the British-born subjects recorded at the Census of India, 17th February 1881. From Government of Bengal.

Report of the External Trade of Bengal, Nepal, Sikkim and Bhutan, for 1882-83. From Government of Bengal.

Returns of the Rail-borne Traffic of Bengal, June 1883. From Government of Bengal.

Annual Statement of the Sea-borne Trade and Navigation of Bengal Presidency, 1882-83. From Government of Bengal.

Report on the Police of the Lower Provinces of the Bengal Presidency, 1883. From Government of Bengal.

Report on the Administration of the Registration Department in Bengal, 1882-83. From Government of Bengal.

A list of Agricultural Implements and Machines which have been experimented with and found efficient and useful in India, 5 copies. From Government of India.

The *Sugarcane*, nine numbers. From the Editor.

The *Indian Review*, Vol. 1, No. 1. From the Publisher.

Department of Agriculture Report for 1881-82, (American.) From Smithsonian Institute.

Census of Bengal, 1881. Vols. I, II, III. From Government of Bengal.

From Dr. G. King, Royal Botanic Garden a quantity of *Corypha Elata* and *Musa Superba* seed, and 10 lbs. of *Crytomeria Japonica* seed. The best

thanks of the Society were voted to Dr. King for his very acceptable contribution.

• EXCHANGES.

Messrs. William Brothers, Ceylon, seeds of Cardamom, Sappan Dye Wood, Croton Tiglum (Croton oil.)

A number of Orchids from Rangoon, Prome and the Coast, comprising Dendrobiums, Vandas, Aerides, &c.

COMMUNICATIONS.

Early amber Sorghum. (*Transferred to Journal.*)

Captain Pogson writes from Dehra Doon on the 31st October :—

"Ten days or so before leaving Mussoorie for this station, I received a parcel from the Kowar Jai Narain Sing of Didwary, which contained nine cobs of maize raised from acclimatized, the parental stock, being imported seed sent to me by your Society in April 1882.

I sent the Kowar fourteen varieties of seed maize, all germinated, grew, and bore cobs, but squirrels attacked some of them when ripening, and the cobs of five varieties were thus lost, but nine were saved.

These were sown in 1883, and the cobs sent me are the produce of the acclimatized seed, and one and all are superior, some being better than parental stock.

The Kowar's success proves that latitude, soil and climate being consulted, upper India is capable of producing all varieties of American maize: the Cuzco being at present the sole exception and even this splendid variety will thrive as soon as the proper locality is ascertained.

By this day's Banghy Post Bearing, I have sent you a parcel containing nine cobs of maize raised from acclimatized seed by the Kowar Jai Narain Sing of Didwary, each cob represents a distinct variety, and I have asked the Kowar to send you direct nine other corresponding cobs, so that two cobs of each may be exhibited. When the Exhibition is over I would wish the nine cobs sent by me to be returned so that I may have it in my power to cause their seed to be sown at Sudianut.

In the parcel I have sent some "Rahmia Cotton" being the produce of the seed you sent me in March last. They were never watered at any time before the rains set in or after their cessation, and were entirely neglected. These things being duly considered, the sample is by no means a bad one.

The Kowar Jai Narain Sing has been cultivating this Cotton, and I hope to hear soon of the results. The drought may have told on the crop."

From Colonel J. Pollock, dated Medcira, 28th August, who writes—"Whilst in India I was member of your Society for 30 years, I am now joining the Association Internationale du Haut Congo. Very little of the country is as yet known but I believe that almost all the Indian vegetables and fruits would

thrive there, might I ask you to send me a collection of all indigenous Indian seeds, particularly various kinds of Brinjals. In return I will do my best to send you seeds the produce of tropical Africa." The Secretary was instructed to make a good collection of seeds for Col. Pollock and to accept his offer of exchanges.

From the Under-Secretary to the Government of Bengal, enquiring regarding the result of experiment with *Musa textilis*, the Secretary mentioned that the experiment had resulted in a failure, and a communication to that effect had been sent to the Bengal Government.

From Henry Thorp, Esq., Editor, *Sugarcane*, a Journal published in Manchester, forwarding eight numbers of the publication and expressing his willingness to continue sending that Journal if found useful.

As the paper contains much useful information regarding the Sugar Industry, Mr. Thorp's offer was accepted with thanks.

From Mr. George Takeda, a Japanese gentleman, formerly a visitor to this country applying for seed of *Calotropis gigantea*.

The application will shortly be met.

From W. Saron, Esq., Chittagong: —

"It was only the other day that I succeeded in procuring you some Chittagong Tobacco Seed. The Natives here are so averse to part with any until they have sown themselves. I send you a small quantity per post, and hope it will reach you safely and germinate.

I was rather premature in putting down the seed you kindly sent me. The Imported seed germinated very freely, but the acclimatized all failed. The heavy rain we had at the beginning of the month, damped off at least three-fourths of that which had germinated, luckily I had saved seed from last year, on which I must now depend for a crop.

I have received a report very encouraging from Mr. Cabannis, of the Agricultural Department in British Burmah, to whom a friend of mine had submitted some leaf I had raised last year. He writes:—'The Tobacco is the best I have seen cured by an Amateur,' and he had it made up into cigars, and some were sent down to me. Every one here who smoked them was in raptures with them. I have sent up the rest of the leaf I had to be made up into cigars, and when they arrive, I shall have much pleasure in sending you a few."

From the officer in charge, Northern District, Andamans, an application for three maunds of Hybrid Tea seed have been received, and steps have been taken to comply with the requisition at an early date.

COTTON.

Mr. Hilderbrand, Deputy Commissioner, Arakan Hill Tracts, has kindly forwarded a quantity of the seed of khakhi cotton in response to an application made to him by the Society, the color of the lint on the seeds is not quite

uniform, but there is no doubt that with careful selection good results could be obtained.

Mr. Lessert, of Bankuli Tea Garden, Ranchi, through Messrs. Gisborne & Co., sends a sample of Buhnia Cotton, he remarks—"This variety is not an unusual plant, but grows into a big shrub." This description, and its growth having been fully treated of before, he was referred to the Society's Proceedings in July 1877 and to the Journal Vol. V, New Series for detailed reports thereon. As this variety of cotton was introduced into India by the Society.

TEA.

As several papers in India have lately had paragraphs on the future of Tea in America, the following extracted from the American Annual Agricultural Report for 1881-82 may be of interest :—"A few remarks relative to the position of Tea culture in America as at present understood may assist us in arriving at an intelligent view of the matter, for the past 20 years the department has distributed a number of the plants in varying quantities of from 10,000, to 50,000 plants yearly, the object in view being to introduce the plant to the notice of farmers and planters, so that they could familiarize themselves with its characteristics, and its adaptability to climates and localities, also that experiments might be made with the leaves, in the preparation of an article for domestic use. In many instances this was so satisfactory, as to encourage further plantings, so that small plantations, of one-fourth of an acre and upwards in extent, were here and there to be found.

Many of the samples of Tea prepared in a domestic way, were pronounced to be very good, and the Department for the past twelve years or more, has frequently been the recipient of Teas which were creditably manufactured and otherwise considered commendable.

In the latter part of the year 1879, Mr. J. Jackson, the present Superintendent of the Tea farm at Summerville, who had been for many years engaged in the manufacture of Tea in British India, being in the United States on a pleasure tour, had his attention called to the efforts of the Department in the introduction of this industry; and looking over the matter he concluded to purchase one of the largest of these incipient Tea plantations, situated in Georgia, for the purpose of making experiments in the manufacture of Tea. His first effort at the manufacture was made in the spring of last year (1880) and the result was deemed encouraging, samples of his Teas were received by the department where they were exhibited and tested; but while the manufacture and appearance of the Teas were commended they were pronounced to be deficient in strength.

During last fall and winter, Mr. Jackson gave a special attention to the plants in the way of pruning, manuring, &c. In consequence, the plants made a most satisfactory growth, giving five crops of leaves, which allowed Mr. Jackson a fair opportunity to test the cost of manufacture, which has convinced him that Teas

may be placed on the market at a cost not exceeding 25 cents per pound. This crop has also been tested by experts, and their opinion again shows that the Teas are deficient in strength. About 20 pounds of this crop was sent to the department, from whence it was distributed for testing, as samples of American Tea. It is therefore evident that the great defect of these Teas is lack of strength.

It is an established fact that the strength of Teas depends upon the climate where the plant is grown. The warmest Tea climates produce the strongest Teas. Teas produced in localities where frosts occur, are always pronounced to be weaker than Teas which are produced in localities where the thermometer never reaches to the freezing point. This is well understood in all Tea-growing countries, and it certainly would not be wise to ignore the fact in making experiments in this country. The position may be considered as fairly represented as follows:—Having every reason to conclude that the locality near McIntosh, Ga; is too far north for the production of Teas, which possess sufficient of strength and pungency, to command the best prices, or even profitable prices, it is therefore considered proper to try the experiment at Summerville, S. C., which is one and a half degrees further north! However unfortunate it may be, it is clearly evident that the Tea experiments must be made in a more southern latitude. The state of Florida may be looked upon as presenting the most favourable conditions, and if the experiments are to be proceeded with, operations should be transferred to that State without delay.

As to the future management of the Tea farm, following the conviction that no experiment which can be made in the culture of Tea at this place, will warrant a continuation of the undertaking, it may be suggested that expenses be cut down to the lowest figure admissible; and that all labor cease, except so much as may be found necessary to look after the young plants.

In a general way, it may be stated that since 1st July 1880, \$15,000 have been appropriated by Congress for encouragement of Tea culture. So far as is visible to the ordinary observer, the only practical, palpable result of expenditure from this fund, is what is to be found, and what has been done in this farm."

Again, the United States *Economist*, says, that—"this (Tea) is an industry which might very profitably be carried on in the south * * * * * In the Tea districts of Japan, there are but few agriculturists who devote themselves exclusively to the culture. The indications, both in the older systems of culture in oriental lands, and in the experiments of America, go to prove that the business may be pursued as a supplement to other agricultural enterprise. Each farmer may raise enough for his domestic consumption, for ten or twelve trees will furnish enough Tea to meet the wants of a family of eight persons, * * * the labour to cultivate a few Tea plants would only absorb the odds and ends of a farmer's time which might otherwise go to waste."

. Early amber Sorghum. (Transferred to Journal.)

THE LATE BABOO PEARY CHAND MITTRA.

The following Resolution was passed at the Council Meeting held this-day:—

In the announcement just made by the President, of the death of Baboo Peary Chand Mittra on the 23rd November, the Council desire in this Resolution to place on record their deep regret at the loss of another valued colleague, whose very lengthy and able services greatly promoted the interests and welfare of the Society with which he had been connected for 36 years.

He was one of its oldest supporters. He became a member as far back as 1847.

For many years he was a Member of its Council and Executive Committees, and ably filled the office of a Vice-President for several terms.

In 1871 he was elected an Honorary Member in recognition of his consistent interest in, and exertions to improve agriculture in Bengal, with which object he contributed some valuable papers to the Society's Journal, besides publishing other writings on kindred subjects.

In his death the Society sustains a great loss.

INTERNATIONAL EXHIBITION.

The Special Committee appointed to arrange for the Society's exhibits at the International Exhibition, reported through the President that a large iron shed 50 x 30 north of the road, issuing from the main transept, had been assigned for the Society's use, the shed in itself one of the exhibits of Messrs. A. and J. Main & Co., Glasgow, represented by Messrs. Duncan Brothers of this city, to whose courtesy the Society is indebted for its use. The Committee reported that they had commenced laying a floor which will be completed in a few days. The following letter sent to the Secretary of the Executive Committee International Exhibition, will make the Committee's arrangements clear to members.

"The Agricultural and Horticultural Society of India take advantage of the opportunity afforded by the Exhibition, to bring forward prominently some of the implements and processes used in indigenous manufactures in India, and have selected a few to be kept actively at work as they consider, that some judiciously chosen typical implements at work, will be more instructive, and will more clearly demonstrate both the general capacities and deficiencies of native modes, as well as the requirements of the country, than the largest collection of Indian implements, not at work, would do.

The two main objects the Society have in view are to show, first, that crude though native implements may be, their cheapness, and the ease with which they can be constructed, worked, or any broken part replaced, render their purchase within the means of ordinary ryots, in a country where skilled labor to put together or repair, any but the most simple rough implements is unobtainable, save in or near to large towns, so that imperfect though native methods may be, as they are not altogether inefficient, machines to complete with them must not only give a large percentage better results, but should be simple of construction, easily repairable, and above all cheap, even from an Indian point of view.

Experience shows that machines combining these qualities find a ready sale in India, and that it is not merely a conservative love of old ways, but the want of skilled labor, as much as that of capital, which prevents the adoption of modern means and appliances. That this is the case, is demonstrated by the fact that intelligent European planters use few, if any, of the many modern agricultural machines for the cultivation of their broad lands, and that for the repairs of such machinery as they are obliged to use in the manufacturing process, they have to retain the services of skilled workmen at a considerable expense.

The second object of the Society is to prove that even with the primitive means, similar to those they exhibit, vast quantities of staples are prepared for the market, so that with better appliances, yielding greater and better results, at the disposal of producers, savings in first cost would be effected and great reductions might be expected to be made in market prices.

A few improved implements such as have found a fair sale in India are exhibited:—

1. REELING SILK FROM THE COCOONS.
2. LAC MANUFACTURE IN PROGRESS—
 - Raw stick Lac.
 - Shellac.
 - Resin.
 - Making Ornaments and Sealing Wax.
3. OIL MILL, WORKING.
4. SUGAR MILL WORKING.
5. COTTON SERIES—
 - Cotton Gin.
 - Cleaning Cotton.
 - Making Twist.
6. HUSKING RICE—
 - Ukhli.
 - Dheki.
 - Japanese Rice Husker.
7. MAKING SCENTS AND SCENT SHOP.
8. INDIAN PLOUGHES—
 - Bengal, Behar, N. W. Provinces, Orissa.
9. IMPROVED PLOUGHES.
10. MODELS—
 - Persian Water Wheel, in use in upper India.
 - Sugar Mill used in East Bengal and Assam, &c., &c., &c.

GARDEN.

The garden has suffered a great loss from the sudden death of Shaik Essuff Ali, the head gardener, who was appointed only in May last; but though he

had been such a short time in charge, he had thoroughly gained the confidence and good will of the Garden Committee, who have, more than once, put upon record their satisfaction at the zealous and intelligent way he performed his duties.

Goberdhan Mally, formerly head gardener of Belvedere who has given proofs of his abilities by winning several prizes at the Society's Annual Flower Shows, has been appointed on probation.

Monday, the 31st December 1883.

W. H. COGSWELL, Esq., *President, in the Chair.*

THE Proceedings of the last Meeting held on the 28th November, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members :—

Lieut. R. W. Macleod, 29th P. N. I., Agra.

F. W. Blechynden, Esq., Chumparun.

The names of the following gentlemen were submitted as desirous of joining the Society.

E. C. Whitehead, Esq., Bogracote Tea Estate, Siliguri,—proposed by Mr. W. M. North, seconded by Mr. C. H. Pillans.

J. Rudd Rainey, Esq., Proprietor, Khulna Estate, Khulna,—proposed by the Secretary, seconded by Mr. R. Blechynden.

CONTRIBUTIONS.

The *Sugarcane*, Nos. 172 and 173, for November and December. From the Editor.

Cultural Industries for Queensland, by Lewis Adolphus Bernays, F. L. S., F. R. G. S., &c., &c. From the Author.

Hand-book to the Ceylon Court, Calcutta International Exhibition, by J. Capper. From the Author.

Dyes and Tans Report, compiled by H. W. McCann, M. A., D. G. C. From Government of Bengal. Two copies.

The *Indian Forester*, No. 12, for December. From the Editor.

Records of the Geological Survey of India, Vol. XVI, Part 4. From Government of India.

The *Tropical Agriculturist*, Vol. III, No. 6, for December. From the Editor.

The Implement and Machinery Review, Vol. IX, No. 104. From the Publisher. Two copies.

Report on Measurements of the growth of Australian Trees on the Nilgiris. From Government of India.

Archivos do Museu Nacional do Rio de Janeiro, Vol. IV, 1879, Insectologia, Flora Fluminensis. From Barthès and Lowell, Foreign Book-sellers, Great Marlborough Street, London.

Specimens of the timbers exhibited by the Forest Department at the International Exhibition. From Deputy Conservator of Forests, Port Blair.

Fifty rooted Vanilla Cuttings. From Dr. King.

The best thanks of the Society are recorded for the above presentations, and a special vote of thanks to Dr. King, for his valuable contribution.

EXCHANGES.

Four lbs. of Teak seed. From J. P. Williams & Brothers, Ceylon.

Five Camellia plants. From China, through the kind offices of Mr. M. Rustomjee.

COMMUNICATIONS.

From the Assistant Secretary to the Agricultural Department of Cashmere, dated Jammú, 15th December, asking for a supply of cotton seed, either American or Egyptian and enquiring whether the Society can arrange for the importation of a large quantity, as His Highness the Maharajah is desirous of extending the cultivation of a good quality of cotton in Cashmere. The Secretary stated that he had in response to the above application, sent some New Orleans and Sea Island cotton seed, and a quantity of acclimatised Bahmia Cotton seed. This last variety has succeeded very well in Bengal, Mr. De Lessert lately forwarded a sample grown on his property, near Ranchi, and in a communication alluded to in the November proceedings, mentioned that the plant is a large shrub, and not an annual like the variety usually cultivated in India. Mr. De Lessert has promised a short Memorandum on the subject.

From Lieut.-Col. T. Cadell, Superintendent, Port Blair and Nicobars, asking for a supply of eight maunds of Hybrid Tea Seed, to be forwarded to him at an early date. Arrangements have been made to meet Col. Cadell's requirement.

From Heinrich Klingsberg, Berge near Lansitz Forest, Germany, regarding the treatment of timber trees in a hot climate, Mr. Klingsberg has been referred to the Forest Department.

From A. Mosley, Esq., Gibraltar, advising the despatch of a box of plants, in exchange for some seeds sent to him, and promising a supply of seeds.

From Phagulal Mandal, Rajmahal, acknowledging the receipt of some books, and asking for the Society's patronage and support for an Agricultural Company he proposes establishing. Referred to the Agricultural Department.

A NEW TEA INSECT.

References to an insect, forwarded from the Lang Sung Tea Estate, have appeared under the above head in previous proceedings. In continuation of the subject Dr. Anderson, of the Indian Museum, who kindly undertook to identify the insect, writes on the 20th instant:—

"I now have the pleasure to send you the information I have received from the British Museum, regarding the moth, feeding on tea in the Lang Sung Estate.

Dr. Günther, of the British Museum, writes:—

'The opinions about the moth do not agree.

1. 'Mr. Butler says that it is not *Eumeta Crameri*, but *Eumeta Wardi* (Moore.)

2. 'Mr. F. Moore says that the species is *Eumeta Crameri*, (Westward,) but that it certainly never fed on tea, but on the *babool*, a species of *Accacia*. Mr. Moore writes to me on the same subject:—

'Can you send me specimens of the moth, and cocoon case of twigs, found feeding on the tea plants in Cachar. I lately saw those you sent to the British Museum for identification, and I identified it as *Eumeta Crameri*. I do not possess any specimen of this species and would be grateful if you can kindly send me such.'

I should feel much obliged if you could procure me still another supply of these insects for transmission to Mr. Moore, so that the question may be settled more satisfactorily.

The best time to send the specimens would be end of April or beginning of May, when the larvae are full-grown.

They should be packed loosely with cotton wool in a strong box with perforated lid."

RHEEA FIBRE.

There have been lately several applications made for information regarding the cultivation of Rhea, more than one being due to an article which appeared in the *Times*, and was reproduced in the Journal of the Society of Arts for November under the heading "China grass." All information at the disposal of the Society has been afforded to applicants.

This Society has ever taken a great interest in Rhea, and was mainly instrumental in identifying it with the China grass, under the circumstances the following extracts from the article referred to will be read with interest:—

"The process as carried out consists in first treating the Rhea according to M. Favier's invention. The apparatus employed for this purpose is very simple and inexpensive, consisting merely of a stout deal trough or box about 8 ft. long, 2 ft. wide, and 1 ft. 8 in. deep. The box has a hinged lid and a false open bottom, under which steam is admitted by a perforated pipe, there being an outlet for the condensed water at one end of the box. Into this box the bundles of Rhea were placed, the lid closed, steam turned on, and in about 20 minutes it was invariably found that the bark had been sufficiently softened to allow of its being readily and rapidly stripped off by hand together with the whole of the fibre, in what may be called ribands. Thus the process of decortication is effectively accomplished in a few minutes, instead of requiring, as it sometimes does in the retting process, days and even weeks, and being at the best attended with uncertainty as to results, as is also the case when decortication is effected by machinery. Moreover, the retting process, which is simply steeping the cut

plants in water, is a delicate operation, requiring constant watching to say nothing of its serious inconvenience from a sanitary point of view on account of the pestilential emanations from the retteries. Decortication by steam having been effected, the work of M. Favier ceases, and the process is carried forward by M. Frémyn. The ribands having been produced, the fibre in them has to be freed from the surrounding mucilaginous secretions. To this end after examination in the laboratory they are laid on metal trays, which are placed one above the other in a vertical perforated metal cylinder. When charged this cylinder is placed within a strong iron cylinder containing a known quantity of water to which an alkali is added in certain proportions. Within the cylinder is a steam coil for heating the water and steam having been turned on, the temperature is raised to a certain point when the cylinder is closed and made steam-tight. The process of boiling is continued under pressure until the temperature—and consequently the steam pressure—within the cylinder has attained a high degree. On the completion of this part of the process which occupies about four hours, and upon which the success of the whole mainly depends, the cementitious matter surrounding the fibre is found to have been transformed into a substance easily dissolved. The fibrous mass is then removed to a centrifugal machine in which it is quickly deprived of its surplus alkaline moisture, and it is then placed in a weak solution of hydrochloric acid for a short time. It is then transferred to a bath of pure cold water in which it remains for about an hour, and it is subsequently placed for a short time in a weak acid bath, after which it is again washed in cold water and dried for the market. Such are the processes by which China grass may become a source of profit alike to the cultivator and the spinner. A factory situate at Louviers has been acquired where there is machinery already erected for preparing the fibre according to the processes we have described at the rate of one ton per day. There is also machinery for spinning the fibre into yarns.

CARDAMOM CULTIVATION.

The following letter regarding the cultivation of Cardamoms was sent in response to an application for information on the subject :—

"I am not aware that any experiments have been made with this plant in Assam or Cachar, though the climate of those localities seems well suited to its cultivation: as it is described as luxuriating near streams, and in places often enveloped in fogs and mists.

I very lately had the pleasure of sending some Cardamom seed to a member in Assam, but of course cannot expect to hear the result for a considerable time.

The substance of the information detailed in your letter is entirely correct and leaves but little to be added. I may remark that felling trees to produce Cardamoms, as practised in Malabar, though it answers the purpose there, does so in a way very different to that attributed to it by the natives, whose super-

stitution is, that the fall of a heavy tree or even of a large branch at a particular season, by shaking the ground, makes it fit for the plant to grow in. Whereas it is merely that a sufficiency of light is given to the dormant bulbs, or seeds, to call them into life.

In cultivating Cardamoms in places where the plant is not indigenous, other systems have to be followed. There are two ways of propagating practised, by bulbs, and from seeds. I will treat of the former first.

In choosing a site the considerations to be borne in mind, are shelter, and rich loamy soil, the most suitable places are hollows, where the plants will be protected from strong winds, and where also the richest soil will generally be found. If the site selected is covered with heavy forest, clear the undergrowth, and either heap it, or burn while partly green, so that the burning may be light, clear away a sufficient number of the trees to let light and air penetrate freely, but leave enough to afford the necessary shade, which is essential for the well being of the plants, and which should be chequered similar to that given by the *Poinciana regia*. Should the jungle be of bamboos, in clearing leave occasional clumps so as to obtain their shade.

Young bulbs, of from one to two years old, should be chosen double bulbs for preference, and all injured or cut bulbs rejected; holes, one foot deep and eighteen inches wide, for their reception, and to act as beds, are made from 6 ft. to 12 ft. apart, the poorer the soil the nearer the plants, and the "beds" made up so that the plant may be a few inches above the level of the surrounding soil, plant the bulbs only just below the surface, taking great care not to bury too deeply, and keep the land clean and free of weeds, stones, rubbish, &c. which is all the cultivation that need be bestowed, the plants will when big enough, smother all the weeds, as nothing grows in their shade.

The fruit is borne on racemes, on shoots, and care should be taken to collect as soon as they ripen, or they will get discolored; picking or collecting the pods is done sometimes by hand, and sometimes with scissors, in the former case the coolies have to let their nails grow to nip the shoots without spoiling the fruit. When the fruit has been collected, the shoots which have borne, and old racemes should be removed.

In fair weather the fruit is dried and cured under light shading, not in the direct rays of the sun, care being taken at the same time that they do not get mouldy. Special arrangements are necessary in rainy and damp weather. Skill to cure to the proper shade of color can only be acquired by practice.

To grow from seed, prepare the ordinary nursery of an Indian Garden with removable mat roof, and sow the seeds, taking care not to put too much earth over them. When they are some 6 in. or 8 in. high prick out, and treat as directed for bulbs, taking care not to plant too deeply, and supporting the young shoot. Some recommend putting two or three plants down together.

I am indebted for most of the above information to the *Tropical Agriculturist* published by Messrs. Ferguson, Ceylon, a most useful publication. Should you

desire more detailed information, I would suggest your getting a book I see that firm advertising, "all about Cardamoms," or some such title.

INTERNATIONAL EXHIBITION.

The following is extracted from the proceedings of the Special Meeting held this day :—

The Exhibition Sub-Committee reported through the President, that a number of the Society's Exhibits are now in their place, and at work daily; though several articles promised have not yet been received from Mofussil members, who had kindly promised aid; they attract much attention.

Some plants have been grouped on the eastern side of the shed and include several of economic value, e. g., Sugarcane, Kheca, Pepper, &c., &c., as well as others of a merely ornamental character.

ANNUAL REPORT
OF THE
Agricultural and Horticultural Society
OF
I N D I A
FOR 1883:

As is customary the Council submit their Annual Report on the Society's operations during the past year.

As the increase or decrease of Members has an important influence on the Society's resources and powers of doing good work, the figures relating to their numbers are dealt with first.

During the year under review, 22 Members were elected and rejoined, the same number as in the two preceding years 1881 and 1882. The resignations were considerably less, 23, as compared with 38 and 55, the number of names removed from the effective list is, however, slightly more, 25, against 22, in 1882, though the number was 28 in 1881. 8 Members have been removed by death.* A number similar to that of 1882 but less than that of 1881. The Council cannot pass over the death of two, at least, of their Members, good and true colleagues, without recording their sorrow. Mr. Firth had only recently been able to take an active part in the conduct of affairs, but sufficient time had elapsed to develop his zeal, energy and ability, and to prove to the Executive the loss they had unfortunately sustained by his unexpected removal; of Baboo Peary Chand Mittra, whose death was noted in the proceedings for last November, the following extract is produced therefrom:—

In the announcement just made by the President, of the death of Baboo Peary Chand Mittra on the 23rd November, the Council desire, in this resolution, to place on record their deep regret at the loss of another valued colleague, whose very lengthy and able services greatly promoted the interests and welfare of the Society, with which he had been connected for 36 years.

He was one of its oldest supporters. He became a Member as far back as 1847.

For many years he was a Member of its Council and Executive Committees, and ably filled the Office of a Vice-President

* *Messrs. Adam Anthony, H. A. Firth, R. Macallister, W. S. Mackenzie, H. Thomson, Rev. A. Williams, Capt. W. J. Williamson and Baboo Peary Chand Mittra.*

for several terms. In 1871 he was elected an Honorary Member in recognition of his consistent interest in, and exertions to improve, Agriculture in Bengal, with which object he contributed some valuable papers to the Society's Journal, besides publishing other writings on kindred subjects. In his death the Society sustains a great loss.

Eleven names have been withdrawn for continued absence from the country, less than in the two previous years when the numbers were 18 and 11 respectively. The numbers therefore now stand as follows—28 life Members, 20 Honorary Associate and Corresponding, and 544 nominal paying Members, of these 58 are absent from India, and 41 have failed to contribute in 1883. Thus reducing the number of effective paying Members to 445 against 450 and 487, the falling off, is as shewn above, due to a larger number being absent from India and non-contributors.

THE FOLLOWING IS A TABULATED LIST OF MEMBERS.

CLASSIFICATION.	In 60 previous years.	In 1881.	In 1882.	In 1883.	Gross Total.	Total real number at the close of 1883 after deducting lapses.
Honorary Members ..	28	1	...	...	29	10
Associate Members ...	6	...	...	...	6	2
Corresponding Members	15	...	1	...	16	8
Civilians, Covenanted, and Uncoveranted .	804	9	3	3	819	57
Merchants and Traders	701	16	8	10	735	93
Agriculturists ...	906	15	22	12	955	197
Military Officers ..	732	7	3	6	748	30
Medical Officers ...	281	2	3	3	289	22
Asiatics ...	402	15	12	9	438	94
Clergy ...	42	2	...	...	44	3
Law Officers ...	151	1	...	1	153	8
Miscellaneous, Police, Civil Engineers, &c.	260	21	10	18	309	68
Total ...	4,328	89	62	62	4,541	592

Of these 113 are residents in Calcutta 398 in other parts of India and 81 out of India.

The usual statement of Receipts and Expenditure is annexed, from which it will be seen that less has been expended on seeds imported from foreign countries, and that the outlay on the garden, though it includes a sum of Rs. 1,700 incurred in pre-

vious years, is not so large. The receipts, however, from this source are less.

A change which has taken place during the year in the staff requires brief notice, the Secretary, Mr. A. H. Blechynden, after 47 years spent in the Society's service, has retired on a small allowance, which the Council regret they were not in a position to make somewhat more commensurate with his very long and able services. Mr. R. Blechynden, Jr., has been appointed Deputy Secretary, and resides at the Garden where, in addition to his general duties, he exercises supervision over the garden work, no Superintendent having been appointed, this arrangement has succeeded to the entire satisfaction of the Council. These changes have caused no additional expenditure.

Flower Show.—The usual Flower Show was held on the 7th February, and there was no falling off in the quality of the plants displayed, some indeed were finer than usual.

Garden.—Under the new arrangement alluded to above, a first rate native gardener was appointed to take entire control over the garden under the direct supervision of the Secretary.

The Council have already in the Proceedings of the 28th November 1883, recorded their sense of the loss, the garden had sustained by the death of Shaik Essuff Ali, the Head Gardener. Goburdhone, formerly mally at Belvedere, has been appointed to the office on probation: notwithstanding these changes, the Committee expressed at their last Meeting their satisfaction with the general appearance of the garden, and their opinion that the present arrangements have had a beneficial effect.

The sales have not, however, been as large as was anticipated, particularly when it is borne in mind that to meet the expressed wishes of Members, catalogue rates of plants have been greatly reduced and will bear favorable comparison with any catalogue published in India. The Council hope, however, that their efforts will be recognised and meet with that support from the public which they confidently think the institution deserves.

A large number of plants have been distributed, both free to Members, and to purchasers, nearly 12,000 having been sent to various parts of India exclusive of cuttings, &c.

The following subjects among many others, have received attention during the year, Khaki Cotton, Ceara Rubber, Early Amber Sorghum, Divi-Divi or American Sumach, Rhea, &c., and as usual information on a large variety of subjects has been supplied to applicants, European and native, members and others, writing from various parts of India, and other countries.

The President in proposing the adoption of the Report just read, said he had nothing whatever to add to the details afforded, and to the position which the Society held, he looked forward confidently to a steady advancement in its position and welfare, as most if not all of its difficulties had been overcome; he had pleasure in moving the adoption of the Report; which was unanimously carried.

*Report of the Agricultural**Statement of Receipts and Disbursements of the AGRICULTURAL AND
HORTICULTURAL SOCIETY OF INDIA, from 1st January to 31st
December 1883.*

RECEIPTS.

From Members, Subscriptions collected during the year	.....	.....	14,222	10	0
,, Proceeds of country vegetable, acclimatized flower and other seeds	.....	855	9	0	
,, Proceeds of surplus stock of American, English, and German vegetable, French and German flower seeds, and Melbourne field seeds, &c. 2,850	0	0			
Hyacinth bulbs	.....	44	8	0	
			3,750	1	0
,, Government—Proceeds of English vegetable and flower seeds, &c., specially imported for H. M.'s Soldiers' Gardens	.....	900	0	0	
,, Proceeds of copies of Journals of the Society	.....	50	8	0	
,, Proceeds of copies of other publications of the Society	.....	4	12	0	
			55	4	0
,, Proceeds of admission tickets for non-members to the flower show held in February	.....	429	0	0	
,, Donation from President for special prizes	.....	51	0	0	
			480	0	0
,, Amount of freight repaid	.....	.....	471	14	3
,, Amount of suspense account in deposit for appropriation on various accounts	.....	.....		38	12
,, Amount of packing and forwarding charges on seeds, plants, &c.	.....	.....			1,998
,, Garién—Proceeds of fruit Grafts	975	4	6		11
,, Proceeds of ornamental plants	1,864	1	9		3
			2,839	6	3
,, Proceeds of boxes, pots, and Wardian cases	.....	387	5	6	
,, Amount of cartage and packing of plants, &c., &c.	.....	282	5	0	
			8,509	0	9
Total Ordinary Receipts, Rs.	.....	.....	25,426	5	3

EXTRAORDINARY RECEIPTS.

From Government of Bengal Donation from December 1882 to November 1883	... 2,400	0	0
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Brought forward	...	2,400	0	0	25,426	5	3
From H. E. the Viceroy's annual subscription	...	250	0	0			
" H. H. the Moharajah, of Burdwan	...	100	0	0			
					2,750	0	0
" Rent of large room of the Hall from December 1882 to November 1883	...	1,200	0	0			
" Rent of Stable and coach- house from December 1882 to November 1883	...	119	0	0			
Amount refund received for matt- ing of large room	...	80	0	0			
					1,399	0	0

GRANT TESTIMONIAL FUND.

Amount drawn out of Interest ac- crued on the invested fund to meet expenses for the Iron plant house erected in the Garden	...	.....	1,448	8	9	5,597	8	9
Total Receipts, Rs.	.....	.....				31,023	14	0
Balance in the Bank of Bengal on 31st December 1882	...	.....				2,509	9	8
GRAND TOTAL, Rs.	.....	.....				33,533	7	8

DISBURSEMENTS.

By Mr. Robert Buist, Junior, for balance of consignments of seeds received in 1882 in full	...	.....	1,224	14	2
" Messrs. Sutton & Sons for ditto for account of the Society ...	814	12	0		
and in full for ditto ditto im- ported for Government ...	708	11	1		
			1,523	7	1
" Mr. E. Benary for do. do. and in part for consign- ment of seeds received in 1883	...	.....	966	10	9
" Messrs. Watson and Scull for charges on Benary's seeds	.....		113	1	0
" Messrs. Vilmorin Andrieux & Co. in full for consignment of flower seeds received from France 1883	...	.....	1,042	4	6
" Messrs. Platz & Sons in full for consignment of flower seeds received from Germany 1883	...	.....	554	1	9
Carried over ...	5,424	7	3		

Brought forward	...	5,424	7	3
By Mr. W. Adamson in full for con-				
signment of field seeds from				
Australia received in 1883	.....	894	9	0
„ Sundry parties for country vege-				
table and miscellaneous				
seeds	.....	687	0	6
„ Freight and charges paid on				
seeds imported for Go-				
vernment	.....	37	6	0
„ Mr. A. H. Blechynden in pay-				
ment of cost of Hyacinth				
bulbs	.....	54	9	0
		6,547	15	

LIBRARY ACCOUNT.

„ Messrs. H. S. King & Co., for				
sundry publications	...	93	15	3
„ Duftry for binding books	...	37	4	0
Local purchase of books	...	20	3	0
		151	6	3

PRINTING ACCOUNT.

• By Printing money receipts Annual				
Reports, letters of call, &c.	.....	.....	90	8

ESTABLISHMENT ACCOUNT.

„ Office Establishment from De-				
cember 1882 to November				
1883, including Secretary's				
Allowance in England	...	.....	.....	9,717

ADVERTISEMENT ACCOUNT.

„ Advertising notices of Meetings,				
Seeds for distribution, sur-				
plus seeds, Bulbs for sale, &c.				
&c.	...	...	...	186

FREIGHT ACCOUNT.

„ Freight paid on packages of				
seeds, plants, &c., sent to				
Members	...	...	...	674

METCALFE ACCOUNT.

„ Proportion of house rates from				
October 1882 to September				
1883 and Police, Lighting,				
and Water rates from Janu-				
ary to December 1883	...	...	540	0
„ Sundry petty works to the Build-				
ing	...	...	51	8
„ Matting the large room	...	...	86	8
			678	0

STATIONERY ACCOUNT.

„ Stationery purchased	58	5
Carried over	...	18,050	1	9

Brought forward	18,050	1	9
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JOURNAL ACCOUNT.

Messrs. T. Black & Co. for Printing 600 copies of Journal Vol. VII Part I	493	8	0
Mr. Liotard for translating notes on coffee plants for the Journal	...	..	30	0	0
					<u>523</u> 8 0

FLOWER SHOW ACCOUNT.

By Prizes distributed to Mallies for exhibiting flowers and vege- tables	...	..	622	0	0
„ Advertising, printing, carriage hire, fee for band, hire of tents, refreshment for Judges and Band and sundry ex- penses incurred	...	..	370	5	0
„ Engraving inscription Silver Prize Medal	...	..	4	0	0
					<u>996</u> 5 0

AGRICULTURAL MODEL ACCOUNT.

„ Cost of a Rice-husking Machine made, drawing sketch of the same and sundries	82	13	6
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PETTY CHARGES ACCOUNT.

„ Postage on letters, Circulars, Journals, &c. &c., and re- ceipt stamps	164	15	6
„ Punkhawallas, carriage, boat and cooly hire, landing and for- warding charges, cost of wax cloth, oil cloth, twine, &c. &c.	361	11	3
					<u>526</u> 10 9

Total, Rs.			20,179	7	0
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GARDEN ACCOUNT.

By Cost of Sundry Materials for propagation of roses, fruit grafts, orchids, &c., includ- ing cost for repairing plant houses	138	3	0
„ Burn & Co.'s claim in full for repairing roads and making culverts in 1881	...	..	1,025	0	0
„ Cost of tools, implements, car- riage, &c., of plants and con- tingencies, including repairs of house printing catalogues of plants, &c. ...	..	..	1,459	12	6
„ Assessment on Garden, House and Service Tax	157	12	0

Carried over	...	2,780	11	6		20,179	7	0
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Brought forward	... 2,780 11 6	20,179 7 0
By Cost of boxes purchased	146 9 3	
„ Do. pots do.	127 7 0	
	—	
	274 0 3	
	—	3,054 11 9
„ Salary of Superintendent from December 1882 to April 1883	... 900 0 0	
and his Commission on Garden Sales	... 90 9 3	
	—	
	990 9 3	
„ Wages of Native Establishment, mullis, coolies, from December 1882 to November 1883	..... 4,320 2 0	
	8,365 7 0	

PLANT ACCOUNT.

„ Mr. W. Bull for balance in full of consignments of plants supplied in 1881	... 508 6 3	
„ W. Paul & Sons, do. do. do.	... 154 5 6	
Geo. Dunlop & Co.'s charge on plants from West Indies	... 29 9 8	
„ Sundry parties for fruit seedlings Crotons, Rose plants, &c., &c., including charges for freight &c., on plants from different places	... 393 10 3	
	—	1,085 15 8
	—	9,451 6 8

PLANT HOUSE.

„ Cost of erecting an Iron house	.....	.....	1,533 0 0
Total Expenditure, Rs.	.....	.....	31,163 13 8
„ By balance in the Bank of Bengal, on 31st December 1883	... 1,869 10 0		
„ In hand of Deputy Secretary to meet expenses on Exhibition account	... 500 0 0		
	—	—	2,369 10 0
GROSS TOTAL, Rs.	.....	.....	33,583 7 8

MEMORANDUM.

and Horticultural Society of India.

lxv.

DISBURSEMENTS.

To amount of ordinary disbursements during the year 1883, as per statement
" Amount of Garden expenditure during the year 1883, as per statement
" Amount of cost of plants purchased " Amount of cost of erecting the Iron plant house
" Balance in the Bank of Bengal on 31st December 1882
" Cash in hand of Deputy Secretary to meet Expenses on Exhibition account

RECEIPTS.

By balance in the Bank of Bengal on 31st December 1882
" Amount of ordinary receipts during the year 1883 as per statement
" Amount of extraordinary receipts during the year 1883 as per statement
" Do, as per ditto
" Amount drawn out of Grant Testimonial invested Funds ..

GRAND TOTAL, Rupees

ASSETS.

Amount of Cash Balance for 1881 & 1882
Balance of subscription, &c., due from Members
Ditto ditto in 1883 as follows :—
Balance of subscription, Rs. 1,469 4 0
Balance of Garden account for plants and Boxes, &c. 280 6 0
Balance seeds, packing freight, &c. 829 5 6
Balance Govt. donation & Rent .. 324 0 0

Total, Rs. .. 33,638 7 8

Memo :

Messrs. Sutton & Sons, for seeds supplied in 1883 £ 119 0 0
Mr. R. Rust, Jr., for ditto 243 0 0
Mr. E. Banary, for balance of £ 75 2 0

Total £ 2,487 0 0 5,994 0 0
Exchange of about 1-71d. for the R.R. 1,220 0 0

Establishment—Office, and Garden Establishment for December 1883 5,214 0 0

Society's proportion cost of erecting the Metcalfe Hall at 23,557 15 9
In landed property including building at Alipore 20,646 6 0
Grant Testimonial Fund invested in Govt. Securities .. 2,890 12 4
.. .. 47,095 2 1

Monthly Proceedings of the Society.

Wednesday, the 30th January 1884.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting, held on the 31st December, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members :—

E. T. Whitehead, Esq., Bogracote Tea Estate, Siliguri,—proposed by Mr. W. M. North, seconded by Mr. C. H. Pillans.

J. Rudd Rainy, Esq., Proprietor, Khoolna Estate, Khoolna,—proposed by the Secretary, seconded by Mr. R. Blechynden.

The names of the following gentlemen were submitted as desirous of joining the Society :—

J. D. Macgregor, Esq., Manager, Urna Factory, Chupra,—proposed by the Secretary, seconded by Mr. R. Blechynden.

John Alfred Du Casse, Esq., Bungala Gor, Mungledye, Assam,—proposed by Mr. Fred. Whitney, seconded by Mr. Wm. Pigott.

C. C. Hicks, Esq., District Superintendent of Police, Busti, N. W. Provinces,—proposed by Mrs. Bean, seconded by Mr. Richard Blechynden, Junior.

F. Collinson, Esq., Barrister-at-Law, Ranchi, Chutia Nagpote,—proposed by Dr. S. Lynch, seconded by Mr. J. V. Woodman.

Minden Mackenzie, Esq., Manager, Dooria Factory, Tirhoot,—proposed by the Secretary, seconded by Mr. J. E. Maclachlan.

E. Chapman, Esq., Chandballi,—proposed by Mrs. Munro, seconded by Rajah Suttyanundo Ghosal, Bahadoor.

Re-joined—Mrs. Bean, Bankipore.

CONTRIBUTIONS.

Memorandum on Silk in India. Two copies. From Government of India.

Memoirs of the Geological Survey of India, Vol. XX, Parts 1-2. From Government of India.

Report on the Internal Trade of Bengal, for the year 1882-83. From Government of Bengal.

Indian Forester, Vol. X, No. 1. From the Editor.

A list of the Grasses of North-Western India, by J. Duthie, Esq. From the Author.

Seven Plants of Habrothamnus *Fasciculatus*. From C. Nickels, Esq., Pussewa Factory, Jaunpore.

A large number of Narcissus bulbs. From A. Mosley, Esq., Gibraltar.

A box of Tasmanian Potatoes. From Major T. Just, Tasmanian Commissioner, Calcutta International Exhibition.

Seeds of 18 varieties of Shrubs. From Dr. King.

The best thanks of the Society were voted for the above contributions.

COMMUNICATION.

From the Secretary, Royal Commission, Victoria :—

SIR,—I have the honor by direction of the President of the Royal Commission for Victoria to intimate that a number of Government collections, consisting of Timber, Seeds, Grain, Minerals, Geological and Natural History, specimens, Maps, Photographs, &c, at present shown in the Victorian Court, will be available for distribution at the end of the Exhibition. The Victoria Government is desirous of securing samples of Indian produce of all kinds, and the President, who is just about returning to Melbourne, will be glad to learn whether your Department desired any of the samples in the Court, and whether it is willing to make an exchange of similar articles. I shall be glad to receive an early reply as it is desirable that the early distribution of the collections should be arranged for.

I have the honor to be,

SIR,

Your most obedient servant,

JAMES THOMSON,

*Secretary,
Royal Commission for Victoria.*

The Secretary was instructed to respond to Mr. Thomson's letter, and to say that the Council would be happy to reciprocate with products from this country.

Several applications have been received for either Models, or drawings of the "Rice Husker," a set of working drawings have been made and sent to one of the applicants, and on their return, tracings will be made and distributed.

Dr. MacGowan, Corresponding Member of the Society since 1851, has returned to China after the absence of a few years and re-opened a correspondence, which has, in past years, been of great value to the Society.

As usual, there have been several applications for information regarding Rhea, Divi-Divi, &c. As there is little or nothing new in the replies furnished they are not reproduced here.

There being, however, some prospect of the Rhea Fibre now being utilized, it will be most useful to collect all details as to available sources of supply, &c. Communications on the subject are therefore invited.

Wednesday, the 27th February 1884.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting, held on the 30th January last, were read and confirmed.

The following gentlemen, proposed at the last Meeting were elected Ordinary Members :—

J. D. MacGregor, Esq., Chupra.

John Alfred du Casse, Esq., Assam.

C. C. Hicks, Esq., Busti, N.-W. Provinces.

F. Collinson, Esq., Chutia Nagpore.

Minden Mackenzie, Esq., Tirhoot.

E. Chapman, Esq., Chandbally.

The names of the following gentlemen were submitted as desirous of joining the Society :—

The Manager, Baghdogra Tea Estate,—proposed by H. J. Leitch, Esq., seconded by Albert Smallwood, Esq.

John Stalkartt, Esq., Indigo Planter, Afrāh,—proposed by W. Stalkartt, Esq., seconded by W. H. Cogswell, Esq.

Corresponding Member.—Major J. Johnston, Madras,—proposed by the Secretary, seconded by J. E. MacLachlan, Esq.

CONTRIBUTIONS.

The *Sugarcane*, Nos. 174, and 175, for January and February 1884. From the Editor.

The *Tropical Agriculturist*, No. 7, for January 1884. From the Editor.

Journal of the Asiatic Society of Bengal, Vol. LII, Part I, Nos. III and IV, 1883. From the Society.

Records of the Geological Survey of India, Vol. XVII, Part I. From Government of India.

Memoirs of the Geological Survey of India, Vol. I. From Government of India.

Returns of the Rail-Borne Traffic of Bengal, for September 1883. From Government of Bengal.

Report on the Administration of Bengal, 1882-83. From Government of Bengal.

Report on the Botanic and Zoological Gardens, Singapore, 1882. From the Superintendent.

The Ferns and Fern Allies of New Zealand, by G. M. Thomson, F. L. S. From Mr. J. Thomson.

A set of Norwegian Books, on Botany and kindred subjects. From C. Holstz, Esq., Ancient Secretary, Foreign Literary Exchange.

Ledger Record of the Economic Plants described in Roxburgh's Flora Indica, 4 copies. From Dr. George Watt.

Ledger Record; complete list of the Medicinal products described by Drury in his useful Plants of India, 6 copies. From Dr. George Watt.

Transactions of the Asiatic Society of Japan, Vol. XI, Parts I and II, and Vol. XII, Part I. From the Society.

The Forest Flora of South Australia, 3 copies. From H. E., Scott, Esq., Commissioner.

Proceedings of the Royal Agricultural and Horticultural Society of South Australia, 1881-82 and 1883, 36 copies. From H. J. Scott, Esq.

South Australia, its History, Productions and Natural Resources, by T. P. Stow. From H. J. Scott, Esq.

Catalogue of Agricultural Implements collected for the Calcutta International Exhibition, 4 copies. From Baboo P. N. Mookerjee, the compiler.

Descriptive Catalogue of Exhibits from Tonquin. From Monsr. Bart Cabasse. The *Indian Forester*, No. 2, Vol. X. From the Editor.

A lb. of Persian Tobacco Seed. From M. Rustomjee, Esq., Consul for Persia, in response to an application made to him on behalf of a member of the Society. A vote of thanks was passed to Mr. Rustomjee.

A large number of Orchids from Mr. Inglis, of Dilkhush, Cachar, which arrived in very fine condition, and for which a vote of thanks was passed.

Ten seers of Khakhie Cotton Seed, from General Sir H. Macpherson, in response to an application made to him on behalf of a correspondent. A vote of thanks was accorded.

A large and handsome portfolio, containing the Forest Flora of South Australia, in three parts, by J. E. Brown, F. L. S. Presented by H. E. Scott, Esq., Commissioner for South Australia, Calcutta International Exhibition. This very handsome presentation was much admired; the illustrations are full size and beautifully tinted. The best thanks of the Society was voted to the donor.

A Silk Reeling Apparatus, from F. D. Maseyk, Esq., Jungipore; this was to have been shewn at work at the Exhibition but arrived too late for the purpose.

The Society's thanks were voted to Mr. Maseyk.

ANNUAL REPORT.

The Annual Report was then read, *vide* Part II, Vol. VII, "Annual Report."

COMMUNICATIONS.

From C. F. Manson, Esq., Naraingunge, forwarding a note on the trees in the Sonthal Pergunnahs, deserving of special attention. (Transferred for Journal, Part II, Vol. VII.)

From Major Johnston, Madras,—“ I am sending you by post to-day a small parcel of Rhea seed, but I much fear they are not in good condition, as I have

tried some in water, and they appear to me light, however, I can send you a much larger supply if you find them good. You will find a description of how they should be treated in Dr. J. Forbes Watson's Report on the preparation and use of Rhea Fibre. * * * The Maddar is now in pod, and I will not forget to send you what you may require when ripe."

The Secretary mentioned that much difficulty had been experienced in obtaining Rhea seeds. As though it grows as jungle in some localities its seed is rarely, if ever, preserved. At Saharunpore Rhea does not bear seed at all as noted in the Society's Proceedings for June 1883. The Superintendent of the Botanical Garden ascribes this fact to all the plants there, being of one sex.

COLONIAL INTERCHANGES.

The following communication has been received from Mr. H. J. Scott, Commissioner for South Australia :—

"I am desired by the Government of South Australia to request the favour from you of such samples of seeds, cereals, &c., you may think suitable for trial growths in South Australia.

The accompanying Hand-book will give you all necessary information as to climate.

Mr. Buck, before leaving, desired me to forward to you a small sample of our Australian Prize Wheat, and at the close of the Exhibition I will send on the same."

Subsequent to the receipt of the foregoing letter, the Secretary had been informed by Mr. Scott, that to his great regret the wheat referred to by him would not be available, as it had become much weeviled and damaged.

The Secretary mentioned that in anticipation of the Council's sanction, he was forming a collection of seeds such as had been indicated by Mr. Scott. It was suggested that many Mofussil members would be able to co-operate, and aid with such indigenous seeds as are available in their localities. The Council therefore invite such contributions. Seed of Sissoo, Mahuah, Bambgo, Jaxoon, Teak, Tea, Coffee, and of Cereals, would be especially useful.

In another letter Mr. Scott says—"I would request you to place before your Society the advisability of their exchanging publications with the Agricultural and Horticultural Society of Adelaide, there might be something useful to each other in their Reports," with this letter Mr. Scott forwarded the Proceedings of the South Australian Agricultural and Horticultural Society for 1881-82, and 1883, 12 copies for each year. The Secretary was instructed to comply with the suggestion, and to establish a permanent interchange which will, no doubt, lead to useful results.

The Secretary reported that he had, with the sanction of the President, sent a circular letter to the leading Calcutta Merchants, nearly all of whom are members of the Society, asking their co-operation in forming a collection of Indian

Products for the Royal Commission of Victoria, who desire to form a reference Museum for the use of Victorian Merchants interested in a trade with India. The circular has met with support from several leading houses, and a collection which may be of great value in influencing trade is hoped for.

MARSDENIA TENACISSIMA.

Captain Pogson, writing from Dehra Doon on the 29th January, says—"I have the pleasure to forward, sample of a valuable fibre, the produce of a creeping plant which grows in the Terai forests of the Doon. The Goorkhas, who are much given to shooting and fishing, make their fishing lines with this fibre, a pretty good proof of its strength," Captain Pogson further kindly promises to try and obtain seeds and plants of the creeper for the Society. The Secretary stated that this fibre (*Marsdenia tenacissima*) attracted the attention of the Society as far back as 1844, and in the Journal for that year a report of trials made with it, amongst other fibres, may be found.

THE LATE REV. T. A. C. FIRMINGER.

At the Council Meeting held this day, the President announced the death of an old and valued member of the Society, the Rev. T. A. C. Firminger, M. A., Honorary Member of the Agri-Horticultural Society of India, and of the Punjab. He was elected a Member in 1851, and an Honorary Member in 1868. His "Manual of Gardening for Bengal and Upper India," which has been through three editions, and is deservedly the most popular book on Indian Gardening, has made his name familiar to almost every European in India. He died on the 18th January, aged 72, at Warren Lodge, Edmonton.

Silos in Bengal.

A sample of Ensilage made by Dr. Greenhill at his farm in Darjeeling, strongly attracted the attention of the members present, the sample was mostly made up of *Reana luxurians*, a fodder plant native of Guatemala, introduced by the Society in 1877. This grass, which is extremely succulent and juicy, has preserved its properties in the Silo, and after four months from the date of being cut, appears as palatable as the freshly cut grass to cattle.

Dr. Greenhill's Silo, though so efficacious, was an extremely simple and inexpensive one. A disused hut was unroofed, its walls carefully plastered or "lipo'd" and was a ready made Silo to hand. 400 maunds of green fodder were filled in; about 200 maunds being first put in, well trampled and heavily weighted on the top, and in a few days when the contents had settled down to about half its original height, the Silo was opened another 200 maunds filled in and again heavily weighted a thick layer of earth, "lipo'd" over, keeping the Ensilage air-tight. As stated above the silo was then left for four months, and on its being opened for use, all but a very small quantity was found in a thoroughly sound condition, the little that there was damaged was due to some slight obstruction having met

a corner board and thus prevented its settling down. The great success that has met Dr. Greenhill's first trial has encouraged him to make a much larger Silo for next season.

A Silo made by General Wilkinson at Fort William was also an unqualified success, General Wilkiuson's Memo. is transferred to the Journal, as it is considered desirable to place on record for future reference all facts connected with what may be termed the Pioneer Silos of Bengal, if not of India. Great hopes may be entertained of silos and Ensilage solving the difficulty which have hitherto met all attempts to reform Indian Agriculture at the outset, *viz.*, the poverty of the cattle.

Details of experiments made in other parts of India, are invited.

VARIOUS SUBJECTS.

A Hyacinth in full bloom was placed on the table by Mr. J. Martin, a fine specimen with two perfect spikes, though so late in the season.

Baboo Joykisseu Mookerjee showed some leaves of Virginia, Maryland, Havaannah, and other tobaccos grown at Uttarpara, near Calcutta, the leaves had been cut for some days and had not been cured, but were nevertheless much superior in appearance and aroma to Indian Tobacco.

Wednesday, the 26th March 1884.

BABOO PROTAPA CHUNDRA GHOSA, *Vice-President, in the Chair.*

The Proceedings of the last Meeting, held on the 27th February last, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members:—

The Manager, Baghdogra Tea Estate.

John Stalkartt, Esq., Arrah.

The names of the following gentlemen were submitted as desirous of joining the Society.

Captain Bullock, Cuttack,—proposed by W. R. Larminie, Esq., c. s., seconded by J. E. MacLachlan, Esq.

The Rajah of Palchier, Palchier, *viz* Cuttack,—proposed by the Secretary, seconded by W. R. Larminie, Esq., c. s.

Lord Charles Fitzgerald, Bonn Tea Estate, Badlipore, Assam,—proposed by H. J. Leitch, Esq., seconded by the President.

J. Newton Wallace, Esq., Manager, Dhumsiri Tea Company, Limited, Golaghat, Assam,—proposed by H. J. Leitch, Esq., seconded by the President.

J. Anderson, Esq., c. s., Magistrate and Collector, Bancoorah,—proposed by Baboo Protap Narain Singh, seconded by Baboo P. C. Ghosha.

Charles Earpe, Esq., Manager, Barrakar Coal Company, Limited,—proposed by W. R. Larminie, Esq., seconded by the Secretary.

ixiii. *Proceedings of the Society.*

Rejoined—R. Bignell, Esq., Cooch Behar.

Elected Life Member.—H. H. the Chief of Khagal and Regent of Kholsapore.

CONTRIBUTIONS.

Tropical Agriculturist. Nos. 8 and 9, of Vol. III. From the Editor.

A list of Publications and Maps relating to Forest Administration. From Government of India.

The *Implement and Machinery Review*, No. 106, Vol. IX, 2 copies. From the Publisher.

Journal of the Asiatic Society of Bengal, Vol. LII, Part. II, Nos. II, III, IV. From the Society.

Proceedings of the Asiatic Society of Bengal, No. IX, November and January. From the Society.

Journal of the Royal Asiatic Society, Bombay Branch. From the Society.

Hand-book to the Ceylon Court, Calcutta International Exhibition, 2 copies. From John Capper, Esq., Commissioner, Ceylon Court.

Field and Garden Crops, N.-W. Provinces and Oudh, with illustrations. Part II. From Government of Bengal.

Report on Arboriculture in the Hyderabad Assigned Districts. From Government of Bengal.

Hand-book of Indian products. By T. N. Mukarjee. From the Compiler.

A rough list of Indian Art Ware. Compiled by T. N. Mukarjee. From the Compiler.

Descriptive Catalogue of Indian Produce, contributed to the Amsterdam Exhibition, 1883. Compiled by T. N. Mukarjee. From the Compiler.

Catalogue of Agricultural Implements, 4 copies. Compiled by T. N. Mukarjee. From the Compiler.

MacIvor's Farmers Year Book, 2 copies. From James Thomson, Esq., Royal Commissioner, Victoria Court.

Victoria Year Book, 1881-82. From James Thomson, Esq., Royal Commissioner, Victoria Court.

Plants in the Botanic Gardens, Melbourne. From James Thomson, Esq., Royal Commissioner, Victoria Court.

Census of Victoria, 1881. From James Thomson, Esq., Royal Commissioner, Victoria Court.

Statistical Register of the Colony of Victoria. From James Thomson, Esq., Royal Commissioner, Victoria Court.

Field and Garden Crops, N.-W. Provinces and Oudh with Illustrations, Part II. From the Author.

EXCHANGES.

From J. P. William & Bros., 7 oz. *Stillingia Sebifera* Seed (Chinese Tallow.)
7 oz. *Rhus Succedatum* (Japan Wax.)

The following Tobacco Seeds:—7 oz. Manilla, 7 oz. Havannah, 8 oz. Brazilian, 8 oz. Chinese large leaved, red-flowered, 8 oz. largest leaved Giant.

Some 11 varieties of orchids, Dendrobiums, Saccolabiums, Cælogyne; Pholidota imbricata, &c., &c. From Rangoon and the Coast.

COMMUNICATIONS.

From the Assistant Colonial Secretary, Natal, advising that in accordance with instructions from His Excellency the Governor, a small packet of the seed of the Tricholoma Rosea, or Natal Red Grass, is being forwarded, in response to this Society's application, dated April last. The Secretary was instructed to convey the best thanks of the Society to His Excellency the Governor of Natal.

Mr. A. Bauermister, of Saigon, in continuation of previous correspondence, asks for certain details in connection with the manufacture of Indigo. The questions refer to time for cutting the plant, duration of steeping, construction of boilers, boiling, &c., &c. Information on these points in detail have been furnished by the Secretary.

From M. Frederick Gallais, of Chateau de Ruffec, France, who writes proposing exchanges of plant and seeds, M. Gallais states that he obtains plants from Brazil, through a collecting Botanist there, and has facilities for getting plants from Algiers. He mentions the plants he would like, Cycads, Palms, Orchids, Nymphaea, and foliage plants, on his part M. Gallais will send seeds and plants, among which he mentions Bromelia, Miltonia, Zigopetalum, Catleya, &c. The Secretary was instructed to write to M. Gallais and arrange for the exchanges as proposed by that gentleman.

From R. T. Greer, Esq., c. s., Assistant Commissioner, Golaghat, Assam, asking for a collection of the best sorts of Sugarcane, for experimental cultivation. The Secretary mentioned that Baboo Joykissen Mookerjee had presented a bundle of *Someshara* and another of *Kajales* cane, and that when other varieties had been procured, they would be forwarded to Mr. Greer, who had promised kindly to communicate results.

From Thomas Mosley, Esq., Gibraltar, promising a supply of seed from the best varieties of Geraniums, and asking for some Indian Orchids.

RICE-HUSKER.

There have been a great number of applications for Rice-huskers, from various parts of the country, two from Assam in Bengali, and one from the Punjab had been received in the previous week. This Machine was made from drawings furnished by the late Mr. Firth, it was kept at work at the Exhibition, where it attracted much attention from natives who appeared much pleased at the quickness and ease with which it performed the operation of husking the rice.

GUINEA-GRASS AND LUCERNE.

An article under the above heading appeared in the correspondence columns of the *Indian Forester* for March, in which it is stated that guinea-grass was "in-

roduced into India apparently not much earlier than 1870, in which year it was cultivated at the Madras Experimental Farm." On reference to the Society's Journal, it will be found that the introduction of guinea-grass into India attracted the attention of the Society in 1836, some 34 years before its cultivation at the Madras Farm; and in the correspondence which ensued Mr. John Bell, the then Secretary, mentions that he had cultivated the grass with success in 1831, and subsequent years. In 1837, four prizes were offered by the Society, ranging from Rs. 200 and a gold medal, for the best guinea-grass cultivation of 20 biggahs, to Rs. 50 for 20 seers of guinea-grass seed. In 1838, mention is made of the grass succeeding in Azimighur, Hissar, Cawnpore, Beaur and Coel, wherever the last-named two places may be, about two maunds of seed having been distributed in that year. In 1848, a curious paper on the cultivation of guinea-grass was forwarded to the Society and will be found in Vol. VI, it was apparently published in Calcutta originally in 1793, dedicated to Sir William Jones. The directions given are clear and concise.

INTERCHANGE WITH THE COLONIES.

From J. Capper, Esq., Commissioner for Ceylon, Calcutta International Exhibition, sending samples of Coffee, Cacao, Cardamoms and Tea, from the Ceylon Court, a vote of thanks to Mr. Capper was passed for the fine samples presented.

From James Thomson, Esq., Secretary to the Royal Commission for Victoria :—

"I have much pleasure in forwarding herewith copies of works published by the Government of Victoria, from which members of your Society may obtain full information respecting the progress and present position of that colony. Agriculture being now the principal industry of the Colony, any books or publications of your Society bearing on the subject in India will prove most acceptable, and I shall be glad to arrange for regular exchanges being made, on my return to Melbourne.

The samples of grain, and other agricultural seeds and products, which your Society was kind enough to promise for distribution in Victoria, should, if possible, be packed without loss of time, otherwise I shall be unable to take them with me as my departure from Calcutta has been timed for the end of the present month. Trusting that these exchanges of products, &c., may result in mutual advantage to both countries."

The Secretary mentioned that the following had been received from Mr. Thomson :—

Brunton Wheat, Victorian 2 and 3.

Frampton Wheat, A. Polson, Mayston.

Grant and Cameron, Purple Straw.

George Smith, Ballarat, Frampton Wheat.

S. Collins, Bridgewater on London.

- 5 and 6 New Zealand L. M. Co.
Grant and Cameron, one sample.
Horsham and Wimmera District Pastoral and Agricultural Society, Polson's
Cape Barley, 86lbs.
Polson's Milling Oats, Sandy, 32lbs.
Polson's Mayston Feed Oats, 32lbs.
J. P. Conway Farmer, Happy Valley, Lancefield.
Samuel Burston & Co., Colonial and Pneumatic Malsters, 123-129, Flinders
Street East, one Bushel Black Malt.
Samuel Burston & Co., three Bushel Pneumatic Malt.
Geo. Smith, one Bushel Tartarian Oats.
Grant and Cameron, Cocksfoot.
Geo. Smith, Ballarat Peas.
The numbers in the above list, refer to the Victorian Court's Catalogue, and
the names are those of the exhibitors.
In regard to exchanges the following samples had been received, in response
to a circular letter sent to the leading Merchants of Calcutta :—
From Messrs. Apcar & Co., Seebapore Jute Manufacturing Company, Limited :—

		Bags.	Yds. of Cloth,
Bags and Cloth E Plain	40" x 29" unhemed ...	5	5
No. 1 "	Plain C 40" x 28" hemed ...	5	5
No. 2 "	Plain C 40" x 28" hemed ...	5	5
No. 2 "	Stripe C 40" x 28" hemed ...	5	5
R and B	Twills 44" x 26½" hemed ...	5	5
Hessian Wheat Bags	36" x 22" hemed ...	5	5
		—	—
		30	30
		—	—

From Messrs. W. Haworth & Co., samples of seed, Linseed, Yellow Rape Seed, Brown Rape Seed, Poppy Seed, Castor Seed, Cotton Seed, Wheat, five samples of Rice, 6 samples of Cotton, 1 of Jute, 6 of Orange Shellac, 1 of Garnet Shellac, 1 of Button Lac.

Mr. French, of Chaoramon, has also contributed seeds of the Sola Plant (*Echynomene aspera*), which he remarks, may be of value in Australia.

Mention is made by Mr. Bernays, in his cultural industries for Queensland, a useful little book, he presented the Society a copy of a few months ago, of the Sola, which was, he says, introduced into Queensland some years ago, but has since died out. The seeds will no doubt be prized.

The Society's best vote of thanks was passed for all the above contributions.

The Secretary reported that large number of seeds had been collected, and would be packed as soon as some expected from the Mofussil were received.

TEA INSECT.

Mr. H. Mackenzie, of Roopabally Tea Company, Cachar, writes that he sends Tea Stick Insects, and damaged branches, from which the mischief, these insects can do, is apparent. He goes on to say, that there appears to be another species, coneshaped, the outside of the Cocoons having no twigs attached but being of a quite smooth, skinlike texture. Specimens of the latter species were not then obtainable, but Mr. Mackenzie kindly promises to forward some whenever they can be found. Unfortunately, both Mr. Mackenzie's packets arrived in a damaged condition, and it is to be feared that some of the moths must have escaped.

In answer to enquiries, addressed to him by the Secretary on receipt of the insects, Mr. Mackenzie writes, that after sending the specimens to the Society, he had sent a batch, of what appeared to be two different species of insects, to the Director of the Botanical Gardens, these samples he thought were better developed specimens and were collected after a storm and 2·55 of rain, Mr. Mackenzie goes on to say :—

"This insect is found in different parts of a garden, but mostly in secluded spots, and cool flat corners, where I have generally found them. The damage they do appears mostly to take place at night. In the day you will observe them making for the base of the bush, or hiding under the foliage, should any be left at this stage of their attack, but that is what generally goes first, the foliage, afterwards they attack the bark, and Tea being a hard wooded plant, is very likely to be killed should the pest remain long enough—as you will be able to judge from the specimen of shoots sent you along with the insects."

Mr. Mackenzie adds that the bushes even when first attacked are easily recognisable from a distance, the young leaves on the plant then appearing riddled; on examination the insects will then be found under the leaves.

Messrs. Begg, Dunlop & Co. also send a parcel containing living Tea insects, all these were forwarded to the Superintendent of the Indian Museum, who kindly identified the insect last year as the Eumata Crammeri and asked for more specimens; a reply has been received, but the information is not yet complete enough for publication.

BEE-KEEPING.

From Mr. J. C. Douglas, "probably some members of your Society would take an interest in Bee-keeping, particularly in the culture of the indigenous bee, which I find is an excellent bee in all respects for cultivation. If any Resident Members of your Society are sufficiently interested, I would be happy to meet them, and show them hives of imported and indigenous bees. I have Italian bees in Park Street and indigenous bees in Alipore, and would meet any one interested, by appointment, at either place any morning at say 8 o'clock." A vote of thanks to Mr. Douglas was passed for his kind offer to show members the details of this interesting industry, and it was resolved, that mention be made of it in the published Proceedings, for the benefit of those interested.

Wednesday, the 30th April 1884.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting, held on the 26th March last, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members :—

Captain Bullock, Cuttack.

The Rajah of Palchier, Palchier *via* Cuttack.

Lord Charles Fitzgerald, Assam.

J. Newton Wallace, Esq., Assam.

J. Anderson, Esq., C. S., Bancorah.

Charles Earpe, Esq., Barrakar.

Major J. Johnston, Mittapolliam, was duly elected as a Corresponding Member.

The names of the following gentlemen were submitted as desirous of joining the Society :—

Charles Parker Bruce, Esq., Tokan, Kaita Tea Estate, Kalnigaon, Assam,—proposed by Fred. Whitney, Esq., seconded by W. Pigott, Esq.

Rev. A. H. Hildersley, M. A., Principal, Lawrence Military Asylum,—proposed by the Secretary, seconded by G. L. Kemp, Esq.

Surgeon-Major J. Wilson, M. D., Officiating Civil Surgeon, Lohardagga,—proposed by the Secretary, seconded by J. E. MacLachlan, Esq.

CONTRIBUTIONS.

The *Tropical Agriculturist*, Vol. III. No. 10. From the Editor.

The *Implements and Machinery Review*, Vol. IX, No. 108. From the Publishers.

The *Sugarcane*, Nos. 176 and 177, of Vol. XVI, March and April. From the Editor.

The *Indian Forester*, Nos. 3 and 4, Vol. X. From the Honorary Editor.

Proceedings of the Asiatic Society of Bengal, No. X, December 1883.

Returns of the Rail-borne Traffic of Bengal. From Government of Bengal.

Memoirs of the Geological Survey of India, Ser. X, Nos. XVI to XLV.

International Meteorological Observations taken simultaneously; from January 1st to June 30th 1882 with Bulletin for each month. Prepared by the War Department, Washington, United States. From Government of India.

Monthly Weather Review of the United States, from February to September 1883. From Government of India.

Precious Stones and Gems, by Edwin W. Streeter. From the Author.

The Great Diamonds of the World, by Edwin W. Streeter. From the Author.

Two boxes of seeds, vegetable and flower. From Otto Mann, Leipzig.

A box of seeds from Mr. Anderson, Prone, including *Bignonia Suberosa*, *Inga xylocarpa*, Teak, &c.

EXCHANGES.

Half a bushel Ceara Rubber Seed. Orchids from the coast including *Phaelonopsis*, *Cyprediums*, *Anæctochilus*, &c.

COMMUNICATIONS.

Major-General W. H. Lowther, an old member of the Society, who has contributed some useful papers to the Journal, writes from Carlisle on the 2nd March, that he is still much interested in horticulture, and has now much glass, and would like seeds of *Primula*, *Erauthemum*, *Barleria*, &c., and seeds suited to a cool green-house.

From G. T. Gibbon Peppe, of Gorkhpore, who sends a sample of "Princess Royal Pea" grown at Birdpore for the last 12 years from selected seed. The original stock was imported in 1868 from Carter & Co., of London. These Peas are certainly very fine and bear favorable comparison with imported peas, either European or Australian; it is of course impossible to tell what their flavor may be, but as far as appearance and size go, there is no failing off perceptible, and it clearly shows what intelligent selection of seed can accomplish, a practice so entirely neglected in India. Ten of these Peas equalled 14 Flacks Dwarf Victory Peas (Sutton's), 15 Nelson's Vanguard (Sutton), 15 Australian (Adamson and Sons), 13 Australian (from Exhibition), 13 Large Marrow Fat (Buist).

Mr. St. Joseph, of Bankipore, Civil Engineer, whose patent ploughs were exhibited with others adapted for this country, by the Society, explains that an attack of illness prevented him competing with his ploughs for a prize, but he thanks the Society for having included his ploughs in their exhibits, and begs to present one of each of them, and his Patent Cotton Gin to the Society. Accepted with thanks.

Captain Pogson, in a letter dated the 11th Instant remarks, that as the Early Amber Sorghum will be cultivated in various parts of India this year, any practical plan for retarding fermentation of the juice would be of value. He then alludes to a custom of the Madras Toddy drawers of applying dry sifted lime to the inside of the earthen receptacles they use, with the object of retarding fermentation, and he thinks this practice, if adopted in Sugar Manufacture, would be highly beneficial. In his reply, the Secretary drew Captain Pogson's attention to the plan practised by Messrs. Thomson and Mylne of Beheea, which they have made widely known to the parties interested through their numerous agents, that of fumigating the portions of the mills with which the juice comes in contact, and the vessels, with sulphur fumes.

Major Johnston, Mittapolliam, writes under date 24th April :—

"I am sending by post to-day a parcel containing "Madar" seed, which I hope will reach you safely, they are the contents of many pods, in opening, the parcel I should cut a small hole in it, otherwise you may lose many if opened in the least breath of wind. Should you want more let me know by return, before the season is over. The juice of this plant is the most certain known remedy for Cobra bite, if it fails nothing else will do. This is not generally known out of this quarter, I got it from an old native Christian Pastor here, who is also a most experienced *medicine man*, and he or his father got it from a wandering tribe by some means, by whom it had been kept a secret for generations. The Pastor has treated many cases, and lost none when taken in time.

Fibres and fibre machines are still interesting me much, any information you can give on them most acceptable."

CASHAW (*PROSOPIS JULIFLORA*.)

A parcel of this seed has been received from Mr. D. Morris, Director, Botanical Department, Jamaica, as well as seeds of *Gouania domingensis*, *Cassia fistula*, *Calyptronoma swartzia*, *Cassia obovata*.

Mr. Morris writes as follows :—

"I beg to forward herewith seed of *Prosopis juliflora*, known here as "Cashaw," which is an admirable tree (often attaining a height of 40 to 60 feet) to grow in dry gravelly soil, and in situations where rain does not fall for months together.

It is fast growing: the timber is excessively hard and of a remarkably durable character. It is used for making knees of boats, and all work requiring strength and tenacity. Posts of "Cashaw" in wire fences last longer than any other, and are in great request for that purpose. Kingston is supplied annually with hundreds of tons of Cashaw, which is the only fire-wood immediately accessible.

The pods are of a sweetish succulent character eagerly sought for by cattle: indeed in some parts of this island during droughts they subsist largely on them. For horses and mules the pods are also admirable food, but I would add that in their case it is very undesirable to allow them to feed upon the pods immediately after they have been exposed to rain, as ill effects have been known to arise from the partially germinated seeds being taken into the stomach, causing great pain and not unfrequently death; this last occurrence, however, is so rare that it need not enter into the calculations of the planter. The tree fruits during dry weather when there is little probability of rain, and if the pods are collected and stored in a dry place they will be ready at hand in a sound state for all forage purposes. When thus stored, the pods, instead of being given whole are often broken up or ground, when they answer admirably instead of corn, oats, &c."

SILOS.

In reply to an application made to him, General Sir H. Macpherson has kindly forwarded a note on his Silo in the Allahabad Fort, which will be found in the Journal now being issued to members. Sir Herbert remarks:—"I will have greater satisfaction in sending you a report on the Eusilage mentioned in the last paragraph of the printed report; as the experiment was made to shew the Indian cultivator Eusilage can be made for nothing more than the cost of digging a pit, and covering the grass (which would otherwise be lost) with the earth excavated from the pit. I enclose a paragraph from the *Scotsman* which will be of interest, and I am able to confirm the satisfactory result of Eusilage from my experience at Allahabad."

Ensilage Experiments at Invergloy, Invernessshire.—A number of factors, farmers, and others interested in cattle and sheep met at Invergloy, Loch Lochy, on Wednesday, to see the opening of a Silo belonging to Mr. G. G. Mackay, the proprietor. He explained that the grass was put into the Silo in October, and that it consisted of the coarse grass gathered in his plantations. Cows, horses, and sheep were supplied with it before the parties present, and they began to eat it at once, and with evident enjoyment. In the byre it was suggested to place some good ordinary hay before the cows along with Eusilage grass, and the results surprised the spectators. Every cow pushed aside the ordinary hay, and ate the Ensilage, thus showing a most decided preference for the latter. The grass was admirably preserved; and, with Mr. Mackay at least, it has evidently passed beyond the stage of experiment. The Silo built by Mr. Mackay is in two divisions, and is large and handsome-looking. The farmers and others present were greatly pleased and satisfied with what they saw, and they are confident Eusilage will make a complete revolution in the feeding of flocks. The hitherto dreaded and fatal months of February, March and April may now be successfully coped with, and many animals saved.

INTERCHANGE WITH THE COLONIES, &c.

Mr. Pugh, of the New South Wales Court, Calcutta International Exhibition, acknowledges, in a letter dated 7th April, receipt of the box of seeds sent to him, and promises to put this Society in communication with the similar Societies of his Colony on his return to Sidney.

From Colonel J. Pollock, dated from Loanga, South-West Coast of Africa, 14th February 1884:—

"I am in receipt of your letter, dated Calcutta, 1st October 1883, and in reply beg to state that the Association International Africaine, would be very thankful to the Agri-Horticultural Society of India if you would send us seeds of Indian fruits and vegetables—in particular those of the Tipparie, called Cape Gooseberry and other names, Custard Apple, Aurungabad Grapes, Brinjals, best

kinds, Chillies and other indigenous fruits or vegetables, including the *Moringa* or Horse-radish tree. If you could send us grafts in Wardian cases, we would, in return, send them back filled with African and Madeira trees, or we will pay all costs. But the quickest and best way will be to send these cases to the care of Messrs. Hutton & Co., the Temple, Dale Street, Liverpool, who are the agents of the Association, and who will forward the cases at once by steamers which leave fortnightly. We want particularly about a dozen plants each of the *Indigenous*, *Hybrid*, and *China* Tea Plants, from either the Assam or Cachar districts. The country round the Kevilu is more favorable than that on the Congo. If you would therefore address the seeds and the cases to Captain Grant Elliot, Commanding, Kevilu-Niadi Expedition, Loanga, South-west Coast, Africa, the Association will be very much obliged.

From what I have seen on the Niger, Congo, and on this Coast, where the Palm from which the oil is made flourishes, I see no reason to doubt that it would equally thrive on the delta of the Ganges, Burramapootra and Irrawaddie, and also on the sea coast, Northern Ceylon, Madras Presidency. It is a source of wealth to thousands of English Merchants trading on this coast, and I do not see why it should not be introduced into India. The mango thrives, especially, on the Niger, but the graft is not known, and if you could send us some of the best varieties, it would be a great boon. If Lichi, Mangoosteen, and other China and Straits fruits could be sent, they would thrive here I am sure. I can send you the Liberian Coffee if you wish it, coffee grows wild in parts of this coast of Africa. If the plants were sent to the Cape, they would have to be sent to Madeira and transhipped here, so it will be best to send them to Liverpool, and we shall get them within two months of leaving India, thanking you on behalf of the Association."

Members residing in the Mofussil are reminded that their co-operation in the collection of seeds, &c., would be of the greatest value, and that seeds of any and every Indian plant, would be useful for exchanges with South Africa, Australia, France, Mauritius, the West Indies, and elsewhere, and that the seeds of many useful products are not obtainable save in the Mofussil; such for instance was the Solah seed lately presented by Mr. French, of Malda, and some Madar seed just received from Major Johnston, Mittapolliam. The ordinary native vegetable seeds, seeds of Timber, and of fibre plants would be particularly welcome.

Mr. George Takeda, of Tokio, Japan, acknowledges a packet of seed of *Catolopis gigantea*, which arrived during his absence to the north part of the country.

He kindly promises seed of the Sorghum which he will send as soon as it is ripe, and further promises to send seed of any Japanese Plants the Society may require.

A NEW TEA INSECT.

In continuation of the notices which have from time to time appeared under this head. Mr. H. Mackenzie, of Roopabally Tea Company, Cachar, on learning that the last packet of insects he sent arrived in a bad condition, has sent a further supply packed in tin. The Deputy Secretary called on Mr. Wood-Mason, of the Indian Museum with these specimens, as that gentleman has kindly answered previous references on the subject. Mr. Wood-Mason mentioned that he was preparing a note on this insect, and has drawings of it in all its stages, as well as prepared specimens. The note is to be published at an early date.

BEE-KEEPING.

Mr. J. C. Douglas, sent a bottle of honey, of which he writes that it was collected by Italian bees in the Asiatic Society's compound, Park Street, and taken by the Centrifugal Extractor without breaking the comb. The honey is beautifully clear and was much admired, and Mr. Douglas is to be congratulated on the evident success he has met in his operation.

Wednesday, the 28th May 1884.

W. H. COGSWELL, ESQ., President, in the Chair.

THE Proceedings of the last Meeting, held on the 30th April last, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members :—

Charles Parker Bruce, Esq., Tokan Kata Tea Estate, Kalaigaon, Assam.

Rev. A. H. Hildersley, M. A., Principal, Lawrence Military Asylum.

Surgeon-Major J. Wilson, M. D., Officiating Civil Surgeon, Lohardugga.

The names of the following gentlemen were submitted as desirous of joining the Society :—

J. Jager, Esq., Mussoorie,—proposed by Col. H. R. Wintle, seconded by John Martin, Esq.

Chas. L. Johnston, Esq., Merchant, Calcutta,—proposed by Geo. Lucas Kemp, Esq., seconded by the President.

D. Jardine Paterson, Esq., Merchant, Calcutta,—proposed by G. L. Kemp, Esq., seconded by the President.

Duncan J. Baillie, Esq., c. s., Assistant Commissioner, Partabgurh, Oudh,—proposed by Major D. G. Pitcher, seconded by R. Deey-Spedding, Esq., c. s.

CONTRIBUTIONS.

The *Tropical Agriculturist*, Vol. III, No. 11. From the Editor.

Proceedings of the Asiatic Society of Bengal, No. 2, February 1884.

Proceedings of the Boston Society of Natural History, Vol. XXI, Part IV, January to April 1882, and Vol. XXII, Part I, May to November 1882. From the Society.

Smithsonian Report, 1881. From Smithsonian Institution.

Memoirs of the Boston Society of Natural History, Vol. III, Nos. VI and VII. From the Society.

Memoirs of the Geological Survey of India, Ser. X, Vol. III and Ser. XIII. From Government of India.

Records of the Geological Survey of India, Vol. XVII, Part II, 1884. From Government of India.

The *Sugarcane*, No. 178. Vol. XVI. From the Editor.

Report on the Census of British India, Vols. I and III. From Government of India.

Report of the Calcutta Court of Small Causes, 1883. From Government of Bengal.

Proceedings of the Agri-Horticultural Society of Madras, March and April 1884. From the Society.

International Meteorological Observations taken simultaneously for the months of January and February 1883, prepared by the War Department, Washington, United States. From Government of India.

Ceratonia Siliqua seed (Carob.) A large quantity. From J. Asphar, Esq.

Over 50 varieties of Indian seeds from Rai Prosono Coomar Banerjee, for which a special vote of thanks is recorded.

EXCHANGES.

Orchids from the Coast.—Six oz. Chinese large leaved giant Tobacco seed, 4 oz. Malabar Cardamoms, 24 oz. Eucalyptus Globulus, 6 oz. Cinchona Robusta.

COMMUNICATIONS.

From H. William, Esq., Executive Engineer, Dun Canals, for seed of *Prosopis Juliflora* mentioned in the Proceedings of the Meeting of the 30th April last, for experimental cultivation, Mr. William promises to communicate results. A packet of seed was sent to applicant.

From F. St. C. Grimwood, Esq., c. s., renewing application for a supply of Tusser Moths eggs, to cross with the Muga Moth. As soon as a supply of eggs can be procured, they will be forwarded to Mr. Grimwood.

An application from Mr. Pryce, of Arrah, for Mr. Douglas' address for the purpose of enquiry regarding bee-keeping was referred to that gentleman, who kindly writes that he will have much pleasure in giving his assistance to any one desirous of obtaining information regarding bee-keeping. A vote of thanks to Mr. Douglas was passed for his courtesy in acting as referee in the matter, his special knowledge being exceedingly valuable.

Mr. A. Whyte, Junior, of Raneegunge, writes for seed of the Early Amber Sorghum, and Jute seed, as he would like to try both on the banks of the Da-mooda. Mr. Whyte mentions that he propose building two or three cheap Silos and kindly promises to furnish a report on them. The seeds asked for have been sent, together with seed of Reana luxurians, as this splendid fodder plant seems well adapted for Ensilage purposes.

Ragunath Mahado Kelker, of Baroda, writes on the 17th May:—

“Yours of the 7th instant to hand. I have also received to-day the drawings of the Husking Machine for which I feel obliged to you. As I am still to move for some days in the districts, I have sent the drawings to a gentleman in the Engineering Department to get the machine made.”

“From your letter of the 18th February, it appeared to me that you have got a Charkhi (Cotton gin) which is an improvement on the one already used in the country. I had written to you to send me a model of that too. If you send me a model or right description of the improvement I have no objection, but a model would do better. I shall send the necessary money both for the preparation and the carriage. My idea is to make a Museum of models of implements ordinarily used by the people, and of such others as could be introduced safely. The models of implements ordinarily in use are already prepared, and I greatly desire at a reasonable cost to secure those which would tend the cultivators to use better machinery.”

“I have tried here the ploughs of different kinds and I would not trouble you for their models.”

“I was told by a friend who had lately been to Calcutta, that he saw an oil mill made by a firm near Calcutta, which works far superior than the ordinary oil mill used by oil men in India. I hope you can kindly give me the name of the firm who manufacture this mill.”

“You are perhaps aware that in Guzerat, Mowra flowers are largely produced. By the introduction of the Sudder Distillery system in several British Districts and in Native States also, the Mowra flowers are not consumed as much as before and their price is reduced to a minimum. I am told that sugar is produced in Chili (America,) from these flowers, and I think it quite possible, as I see that a substance like Jagri is prepared from them by a boiling process. If attempts could be made to prepare sugar from the Mowra it would do I think immense good to the poor people of this province.”

“I think it is necessary first to ascertain (1) whether sugar can be prepared, (2) if so, what quantity per maund of Jagri, (3) whether it will be worth while to prepare sugar from this substance on a large scale, (4) whether the smell of the Jagri prepared from the flowers could be removed.”

“If you can point me out any gentleman who can make the above experiments and give a professional opinion thereon I would send some Jagri, and money if any will have to be paid as fee.”

"Your Society has been making attempts for the good of the people, and this as well as your prompt and kind replies induce me to write to you."

Moulvi Naziruddeen Ahmed, a Member, writes from Bihar on the 19th May, enquires regarding the cultivation of the Mangoes what steps should be taken to improve the fruit, methods of forcing when out of season, &c., the Moulvi states that he takes great interest in this branch of horticulture and would be glad of hints on the subject.

As the cultivation and forcing of this fruit must have great interest for most Indian gardeners, members who have had special opportunities of studying the subject are invited to communicate their different methods through the Secretary.

Messrs. William Brothers, of Ceylon, in their letter forwarding the seeds noted in the exchanges above, say—"We have tapped a Ceara Rubber tree of six years age, at the beginning of this month, three days successive tapping with an ordinary knife gave 8 $\frac{1}{2}$ oz. dried rubber; Ceylon Ceara Rubber has already been valued in London at 3 shillings per lb. The operation can be done twice a year."

TOBACCO.

From T. W. Holderness, Esq., c. s., Under Secretary to the Government of India, dated Simla, 13th May 1884:—

"I am directed to request that you will be so good as to favour this Department with your opinion on the accompanying samples of tobacco, cured at Nariad, in Guzerat, in the Bombay Presidency. The tobacco was grown from (1) indigenous and (2) from imported Virginian seed."

From Messrs. Begg, Duulop & Co., Calcutta, dated 20th May 1884:—

"We are in receipt of your letter of date, forwarding two samples of tobacco leaf grown and cured at Nariad, Guzerat. We have, however, already received similar samples direct from the Department of Revenue and Agriculture for report by our American expert, and as soon as he submits his opinion thereon, we shall be happy to advise you with a copy thereof. In the meantime we return your samples."

"In continuation of our yesterday's letter we now give you the following extract from our Poosa Manager's report on the two samples of tobacco leaf from Nariad":—

"No. 1, or that grown from indigenous seed seems to be a first rate tobacco, "and if properly cured by an expert would fetch a good price in the English "market. It has been very fairly cured, but an experienced hand would have "cured it so as to bring out its color, which would have been a good bright: the "texture is good. Some of the leaves slightly coarse but taking it as a whole I "should have said without knowing it that it was grown from Virginian seed, "and compared with sample No. 2, which was supposed to have been grown

"from Virginian seed, I am inclined to think that the wrong samples were put "in wrong covers or else the indigenous seed must have been mixed with "Virginian at some recent date. The flavor is good."

"Sample No. 2, grown from Virginian seed is not a fair sample as it was cut green. Most of the leaves appear so, and badly handled, and have a decided native flavor, texture bad and coarse."

From K. Euler, Esq., Calcutta, 28th May 1884:—

"I have examined the samples of tobacco sent to me, and I entirely concur with the opinion given by Messrs. Begg, Dunlop & Co. Of the two samples, I decidedly prefer No. 1 grown from indigenous seed, as it appears a better grown and more developed tobacco, leaves of finer texture and thinner stem than No. 2. If such tobacco can be grown from indigenous seed, there is certainly no necessity to import American seed to that part of the country. Both kinds are a useful class of tobacco of good flavor and fair color, but rather deficient in burning. The color might be improved upon by better curing and should be bright yellow rather than dullish brown and greenish. In that case it would be quite fit for the English market and bring a good price."

Copies of these opinions have been forwarded to the Government of India.

MADAR (CALOTROPIS GIGANTEA.)

A number of communications have been received from different parts of India regarding this shrub, called forth by Major Johnston's letter published in the last Proceedings in which he mentions that the plant is supposed to be an antidote to cobra poison; many correspondents appear to think that the numerous properties of plant have not previously attracted attention. Yet over 30 years ago the very superior fibre it yields, one of the strongest of the many Indian fibres, attracted the attention of this Society; and its other qualities have been noted.

Major Johnston has been asked which of the two species of Calotropis (C. Gigantea and C. Procera) is thought to have special virtue in cases of snake bite, his reply will be noted in due course. Meanwhile the following notes kindly furnished by different Members may be of interest, being original.

The two species are readily distinguishable by the flower, that of the C. Gigantea being rose or lilac colored, and of the C. Procera white.

"There are two varieties of the Akhaun (Calotropis Gigantea) growing in this district (Jessore.) One of them, the white flowered variety, called by the natives Seth Akhaun, and the other the lilac flowered variety called by the natives Nela Akhaun, the former of which is used by the Natives here in cases of snake bites generally and cobra bites especially—their recipe is as follows:—

Take a 2 anna piece weight ($\frac{1}{8}$ th of a tola) of the peel or outer covering of the root of the Seth Akhaun, and half that weight of common ginger. The patient is to chew both the above ingredients together in his mouth, and if they

taste sweet it indicates that the virus has entered into the system ; in that case he is to chew successive doses of the above medicines until they taste bitter to him, when it shows that the poison has been counteracted and that he is free from danger. Of course the patient must swallow the juices of the medicines along with the saliva, rejecting the refuse from his mouth. The natives here place implicit faith on this medicine, considering it an infallible cure; but I have little doubt that it has little or no efficacy, like all other reputed antidotes for snake bites, for when it *apparently proves* successful, it simply arises either from the snake not having injected its poison into the wound, or from the poison-bag being at the time exhausted of its supply ; and that such cases sometimes occur will be found from the results of Dr., now Sir Joseph, Fayrer's experiments, as noted in his well known work on the subject. The above plant has many valuable therapeutic properties which are too numerous to detail here ; they will be found mentioned in Col. Drury's "useful plants." I may add that it is one of the strongest fibre yielding plants, but owing to its not thriving under cultivation it is not able to be utilized to any appreciable extent.

JNO. RUDD RAINES*

"The medicinal properties of this plant have been pretty fully described by Dr. Kanilal Dey in his indigenous drugs of India, by Dr. Uday Chand Dutt in his Materia Medica of the Hindoos, by Dr. Waring in his Bazar Medicines and by other writers.

The various parts of this plant not only form important elements in several standard Hindoo medicines, but they are also very largely used by the people of this country as domestic medicines.

There are two varieties of the Madar plant,—the red flowering and the white flowering. Both the varieties are useful in leprosy, carbuncle, enlarged spleen, &c.

The white variety is said to be a good appetiser, digestive and a curative of cough and asthma.

The red variety is said to be good in colds and in inflammatory diseases, looseness of bowels, lepra, worms, skin-diseases, dropsy, and in enlarged abdominal viscera.

The *flowers* are used as a tonic appetiser and digestive. The *bark* of the root is used in cough, asthma, dysentery, diarrhoea, skin diseases, and inflammatory diseases. It is said to be a good substitute for Epicacuanha. In 12 to 15 grain doses it is used as an Emetic and in 2 to 5 grains it is used as a Diaphoretic. The *leaves* mixed with rock salt and roasted within a closed vessel are widely administered in enlarged spleen. The milky *juice* is used as a purgative, and also as a sedative in toothache and caries. In syphilis and mercurial disease the milky juice of the plant and also the impregnated juice of the leaves are held in great esteem and are widely used with unvarying success."

JOYKISSEN MOOKERJEE.

From Henry E. French, Esq. :—

"Kindly enquire of Major Johnston, of Metapolligm, if it is the juice of the white or the purple flowering Madar which is the specific for cobra snake bite."

We have both descriptions in this district, the natives prefer using the leaves of the white for rheumatic pains and the juice of the white in leprosy."

INTERCHANGE WITH COLONIES.

In the Proceedings for March the receipt of a letter from the Assistant Colonial Secretary, Natal, was noted, advising the despatch of the seed of *Tricholæna rosea* applied for by the Society, the case was apparently taken delivery of by the Agricultural and Revenue Department under some mistake during March, but the seed is now available to members who can give this grass a fair trial, and will submit the result of their trials.

From Messrs. Schoene, Kilburn & Co. :—

"Referring to your favor of yesterday we send you per bearer one case containing Shellac, Lacdye, and Sticklac samples, and three packages Dunbar Cotton-mill Yarn." These will be forwarded to Melbourne in due course.

From D. Morris, Director of the Botanical Department, Jamaica, dated 15th April 1884 :—

"By this post I forward some seeds of the Tree Tomato which I believe should do well in certain parts of India, especially in the hills. A few particulars are herewith enclosed.

Tree Tomato.—This is the popular name of a fruit naturalized in Jamaica and found in many old gardens in the coffee districts of St. Andrews' and Manchester.

By the kindness of Sir Joseph Hooker it has been determined as *Cyphomandra betacea* a native of South America, including Peru and Chili where also it is under cultivation. The plant (belonging to the natural order Solanaceæ) is of shrubby habit about five or six feet high. It is not generally known and seldom used in Jamaica, but it is without doubt a fruit that should be more largely cultivated, as it answers in every respect the purposes for which the ordinary tomato is esteemed.

Plants are easily raised from seed, which come into bearing in about two years. They are very prolific bearers and the fruit is available during the winter months November to March when ordinary tomatoes are not so easily obtained Elev. 2,000 ft. to 5,000 ft.; Temp. 70° Fah. to 63° Fah."

A useful assortment of Millets and other seeds has been collected and will be forwarded to Australia as soon as communications are received from the Commissioners to the late Exhibition.

TEA INSECTS.

Several sets of specimens have been received from Mr. H. Mackenzie, of Roopabally, Tea Company, Cachar, which have been forwarded to Mr. Wood-

Mason of the Museum, who in acknowledging the last batch mentions that he thinks he has now enough for his purpose.

Wednesday, the 25th June 1884.

W. H. COGSWELL, Esq., *President, in the Chair.*

THE Proceedings of the last Meeting, held on the 28th May last, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members:—

J. Jager, Esq., Muscoorie; Charles L. Johnstone, Esq., Calcutta; D. Jardine-Paterson, Esq., Calcutta; Duncan J. Baillie, Esq., C. S., Assistant Commissioner, Purtabgurh, Oudh.

The names of the following gentlemen were submitted as desirous of joining the Society:—

Baboo Nemai Chundra Basu,—proposed by Baboo Protapa Chundra Ghose, seconded by Baboo Joykissen Mookerjee.

The Manager, Goosery Cotton Mills Company, Limited,—proposed by the President, seconded by C. H. Denham, Esq.

CONTRIBUTIONS.

Annual Report of the Royal Botanic Garden, Calcutta, for 1883-84. From the Superintendent.

Annual Report on the Government Cinchona Plantation in Bengal, for the year 1883-84. From the Superintendent.

Report of the Committee of the Bengal Chamber of Commerce, from 1st May to 31st December 1883. From the Secretary.

Journal of the Asiatic Society of Bengal, Vol. LIII, Part 1, No. I, 1884. From the Society.

A descriptive Atlas of the Eucalyptus of Australia and the adjoining Islands Ninth Decade. From Baron Von Müller.

Introduction to the Annual Accounts of the Sea-Borne Trade and Navigation of the Bengal Presidency, for 1883-84. From the Collector of Customs.

International Meteorological Observations taken simultaneously, for the month of March 1883, prepared by the War Department, Washington, United States. From Government of India.

Report on the Progress and Condition of the Royal Garden at Kew during the year 1882. From Government of Bengal.

Annual Report on the Gardens of H. H. The Maharana of Oodeypore, G. C. S. I., &c., for 1883. From the Superintendent.

Proceedings of the Asiatic Society of Bengal, No. III, March 1884. From the Society.

**Administration Report of the Hazaribagh Reformatory School for 1888.
From Government of Bengal.**

A basket of Orchids. From G. L. Kemp, Esq.

A small packet of Ceara Rubber seed. From Messrs. Schoene, Kilburn & Co.

Seventy Araucaria Ghuaca seeds. From J. P. William & Brothers, Henerat-goda, Ceylon.

A large quantity of mangoes from J. D. Maseyk, Esq., Jungipore, who has kindly promised to present the Society with a collection of mango grafts, and wished to give the Council an opportunity of tasting the fruit. A cordial vote of thanks to Mr. Maseyk was passed.

Dr. MacGowan, Corresponding Member, sends as a specimen of the ornamental articles manufactured with the square bamboo in China, a plate or tray made of split bamboo neatly fitted together, with an ornamental design pasted or glued on it in relief, the design is in one piece and the full size of the tray (about 18 inch x 12 inch), and Dr. MacGowan thus describes the process by which the bamboo is made into a sheet of the size required. It is split at one side, soaked in water, spread flat, and heavy weights placed on the top till it is perfectly flat and smooth like a board. The design is then cut out with a knife and glued to the object to be ornamented. A piece of the flattened bamboo is sent with the tray.

COMMUNICATIONS.

From Colonel Stewart, Superintendent of the Harness and Saddlery Factory, Cawnpore:—"I have the honor to advise despatch this day of a small packet of Sumach seeds which I obtained from Professor Comas, Professor of the Agricultural College of Naples. I have tried this seed but have not got any to germinate, I shall be obliged by your trying them and letting me know the result at your convenience."

The Government of India in this Department has to import this expensive material, Sumach, from England, and it would be a saving if this plant could be acclimatized in some part of India, besides which it might form an article of commerce. The plant, the *Rhus coriaria*, grows freely in Sicily, Southern Italy and the Levant. I note that the seeds are very hard and that it seems impossible to make any impression on them."

The seeds sent by Colonel Stewart have been sown under various conditions at the Society's Garden ; a report on them will be published in due course.

From Messrs. Begg, Dunlop & Co., asking for drawings of the "Rice Husker" to which allusion has been so frequently made of late. Complied with.

From J. Stanley Collier, Esq., c. s., Officiating Collector of Customs, Calcutta, forwarding copy of Annual Report on the Administration of the Customs Department in Bengal for the year 1883-84. Acknowledged with best thanks.

J. Anderson, Esq., Prome, for seed of the quick growing paddy sown in land liable to high inundation in Bengal, as he wishes to try it in some low lying

lands; the seed does not appear to be procurable in Burmah; some has been sent to Mr. Anderson.

From C. Peterson, Esq., an application for Early Amber Sorghum seed. Complied with.

From L. J. K. Brace, Esq., Officiating Superintendent, Royal Botanic Garden, presenting six fruit of the Willoughbeia for the seed, the plant is a large climber and yields a Caoutchouc. A few seeds are available to members wishing to give this plant a fair trial.

The Rev. W. H. Stevenson, of the Pachamla Mission, Sonthal Pergunnahs, kindly procured both eggs and moths of the Tusser worm, which have been forwarded to Mr. F. St. C. Grimwood, c. s., of Assam, whose application was mentioned at the last meeting. Mr. Stevenson mentions that the moths had not ceased laying when he got them from the villagers.

Application from Debi Lall, Bikram, *et al.* Bankipore, for information regarding "The Hindustan Plough" which a friend of his had seen at the late Exhibition, but had not been able to see it at work. The required information was duly supplied.

Colonel W. B. Thomson writing from Chindwara asks for some seeds of the Tree Tomato, mentioned in the last Proceedings. As the soil is good and Chindwara is 2,250 feet above the level of the sea, Colonel Thomson thinks the plant should do well there. Seeds were sent with a request that a report as to its success be given, as this plant (*Cyphomandra betacea*) is a new introduction to this country.

From T. W. Holderness, Esq., c. s., Under-Secretary to the Government of India, for one copy of the *Journal* for 1879, Part I, Vol. VI, and 2 copies of Part III, Vol. VI, for 1881. Complied with.

From V. de Robillard, Esq., Mauritius, Officiating Secretary to the Science and Arts Society, forwarding two copies of a pamphlet by M. de Chazal on the preparation of Aloe fibre, and a book on the cultivation and preparation of Vanilla, of this book Mr. de Robillard says—"it is now rare, but I have had the good chance to obtain it for you."

D. Morris, Esq., Director, Botanical Department, Jamaica, writes that owing to the drought the crop of Mahogany seed has been very small, and he is unable to meet this Society's application, he has, however, sent some good seed to Kew and hopes the Society will receive an appreciable quantity from that source.

RHEA FIBRE.

Among other applications for information under this head, the following was received from Messrs. Begg, Dunlop & Co.:—

"We beg to send herewith a small tin containing a sample of Rhea Fibre, made from Rhea plant grown in Assam, and manufactured by a New Zealand Flax-dressing Machine. Will you kindly have this examined by an authority, and let us know his opinion of it as also its commercial value? Any hints

you can obtain for us as to planting, growing, time of cutting, &c., would be most acceptable, as the gentleman who has sent the sample has only grown a little as an experiment."

The sample was submitted to the Fibre Committee, and the following report was kindly furnished by the President:—

"I have carefully examined these samples of Rhea Fibre. I am of opinion that in their present form and condition they are of little or no commercial value.

The utmost possible care and attention are required in the manipulation of the cut stalks of this plant, with a view to separating and preparing the Fibre therefrom. These samples exhibit a want of the requisite knowledge and needful care in their preparation, to make them sufficiently valuable and attractive to the trade, which hitherto has been confined to the Home markets.

I advise that further samples should be prepared and submitted, that in doing so all particles of bark, hard conglomerated pieces of gummy, mucilaginous matter, be avoided, and kept out of the sample, and that some data should likewise be afforded as to the weight of the stalks which have been operated upon, the quantity of Fibre extracted, and the cost of doing so, all such information being essential if an experiment is to be of any value for future guidance."

W. H. COGSWELL.

MADAB (CALOTROPIS GIGANTEA.)

The previous notices which appeared in the Proceedings having attracted much attention, Major J. Johnston, whose reference first drew notice to it, received a number of letters of enquiry on the subject from all parts of India, he therefore sent his informant's notes on the subject to the *Indian Agriculturist* for general information. Major Johnston's informant is a Pastor with a considerable local reputation as a "medicine-man," he has a free dispensary of his own, which receives but slight help occasionally from the charitably disposed, and he visits the sick poor in their own huts, without fee or charge. The Pastor has a cholera specific and a medicine which he administers in hydrophobia cases, both of which he has promised Major Johnston to make public, as he does not practise for private gain.

The letter and notes sent to the *Indian Agriculturist* are here re-produced for future reference:—

"MADAB" AS A CURE FOR COBRA BITE.

To the Editor.

SIR,—Having received many enquiries on the subject of the "Madar" cure for cobra bite, may I ask you to insert the following description of it, kindly supplied to me by Mr. V. Unmegudiam, of the London Mission Society, a resident here for many years? The plant used is the *Calotropis gigantea*, or Swallow

wort, has a pink flower, and grows in the plains in this Presidency almost everywhere.

Mr. V. Unmegudiam has also treated hydrophobia with great success, as well as cholera, not having lost, he tells me, a single patient. He has promised to furnish me with a description of his treatment for publication.

1st June 1884.

T. JOHNSTON.

I.—*Description of the Madar Plant.*—In this part of the country, I have seen only two kinds of the plant: the one, white in the stem, flower, &c., and the other a kind of pinkish colour in the flower, but green in stem, leaf, &c.

The leaves of both these plants contain on the outer side a kind of fur-like substance which can easily be gathered by merely rubbing them with the hand. The white kind is believed to be the strongest; but the plant is not so extensive in growth as the other. But I, and others taught by me, have used the pinkish kind only, in cases of cobra and snake bites. The whole plant with its roots, &c., is used for different kinds of poisonous bites, &c.

II.—*The application of it as Medicine.*—As soon as a person is bitten by a cobra or any snake, gather the tender buds which the tree contains in abundance, press them with the hand, adding the milky juice that runs out from the broken parts, till a pill as big as a common marble (for an adult) is formed. Then roll it in betel or any eatable leaf, and ask the bitten person to chew and swallow it. It is the milky juice of the plant that is the most effective remedy. Repeat the dose every half-hour, till the numbness begins to descend, when the dose may be lessened and given every hour or so, till sensitiveness is restored to the whole part. In no cases would it require more than nine doses, except in cases of very strong bites. If the bitten person be in an unconscious state and not able to swallow, the pill may be dissolved in water and administered. It is also useful to bleed the bitten part, but this was not done originally.

Diet.—Very light till full recovery; rice and water, cunjee, bread, coffee or tea. All stimulants should be avoided. After recovery, the patient must have a dose of purgative. If the patient throws up after taking the pills, recovery will be rapid.

The efficacy of the remedy has been proved by me and others taught by me, for a long period of time.

To preserve the milky juice of the plant, gather the fur-like substance from the outside part of the leaves and make it into a paste with as much milky juice as may be necessary, make into pills, dry them in the shade, and bottle.

V. UNMEGUDIAM,
Pastor, L. M. S.

METTAPOLLIAM, 31st May 1884.

INDIAN WHEAT AND ITS IMPROVEMENT.

Captain Pogson has forwarded the following paper under the above title for insertion in the Proceedings. *Transferred to Journal Part iii., Vol. vii.*

CIRCULAR LETTER TO PROPRIETORS OF TEA AND OTHER ESTATES.

At the Council Meeting held this day a draft of a letter from the President to the Secretaries, Agents, and Proprietors of Tea and other Estates was approved, and it was resolved that it should be transferred to the Proceedings for the information of Members:—

"The numerous and important references and communications that are made to this Society on most subjects, generally within its scope, and the readiness by which those are met with the sought for information, induce me to address this letter to those Companies, firms, and individuals who represent large interests in Indigo, Tea, and similar mercantile undertakings, with the view of enlisting their membership to the Society, which has rendered incalculable benefits to this country during the past 64 years, and in recognition of the good work it has done, is doing, and will continue to do, more extensively with their united assistance.

There are already on the list of subscribers 100 Managers of Tea and other Companies and it is my wish, which I feel confident you will concur in this representation, that you will become a subscriber, in the name of the Manager for the time being, of the respective gardens or Factories which you represent. The cost of doing so for the first year, which includes the entrance fee of Rs. 8, would be Rs. 40, or 13 annas only per week, and for each following year Rs. 32, or 10 annas only per week.

I am sure you will agree with me that the sum is very trifling, will not be felt in your expenditure, and that apart from the question of such a small outlay you will get not only its equivalent value in seeds and plants, &c., but that you will recognise the necessity to assist those Managers who have a taste for such pursuits, and encourage others, and their assistants likewise, by your countenance and support.

It will help them to much essential knowledge, promote your mutual interests, strengthen the resources of this Society, and enable it to reciprocate to the fullest extent.

Trusting that you will allow me to have the pleasure of proposing your several Managers as Members, and that I may hear from you to that effect on an early day."

INSECT PESTS.

From Messrs. Begg, Dunlop & Co.:—

"We send you a bottle containing some diseased tea leaves and shoots, which we have received from our Manager at Koomber, Cachar, and which we shall be

much obliged by your having carefully examined, with a view to ascertaining what the blight is that appears on them. Our Manager says he has enclosed in the bottle what he thinks may turn out to be the eggs of the insect, and should this be the case, he hopes something may be suggested by which to check the pest.

Should you not succeed in tracing the insect, we are requested to send the bottle home, so kindly send it back to us after inspection."

The Deputy Secretary called on Mr. Wood-Mason of the Indian Museum with the specimens, who kindly promised to give the matter his early attention. Mr. Wood-Mason's letter on the subject is as follows:—

"Three or four of the leaves and the piece of the stick contained in the bottle you left with me this morning, bear small patches of eggs of some Homopterous insect. The eggs appear to be always regularly arranged. I have met with them frequently on tea-bushes, to which I could never satisfy myself that they did any harm. I believe they are the eggs of an insect closely allied to, and about the same size as the little green flies which are such a pest in the rains in Calcutta. I should be glad if your correspondent would send me some of the flies in strongest spirit, rum does all very well as a killing agent, but something stronger is needful for preserving animal tissues in a fit condition for examination. Your correspondent speaks of 'diseased' leaves: in what way are these leaves diseased? What is the nature of the injuries inflicted on the tea-bushes by this supposed pest?"

Wednesday, the 30th July 1881.

W. H. COGSWELL, Esq., *President, in the Chair.*

THE Proceedings of the last Meeting, held on the 25th June last, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members:—

Baboo Nemai Chundra Basu, Calcutta.

The Manager, Goosery Cotton Mill Company, Limited, Goosery.

The names of the following gentlemen were submitted as desirous of joining the Society.

The Manager, Burhoga Factory, Sarun,—proposed by M. W. Mackenzie, Esq., seconded by the Secretary.

James J. Jellicoe, Esq., Deputy Conservator of Forests, Gouhatie,—proposed by Dr. J. Mullane, seconded by H. J. Leitch, Esq.

W. B. Colville, Esq., Merchant, Calcutta,—proposed by the President, seconded by the Secretary.

The Manager, Tingri Tea Company, Limited,—proposed by the President, seconded by G. L. Kemp, Esq.

The Manager, New Terai Association,—proposed by the President, seconded by H. J. Leitch, Esq.

The Proprietor, Nahor Rani Tea Estate,—proposed by the President, seconded by G. L. Kemp, Esq.

The Manager, Nilgiri Raj, *vid* Balasore,—proposed by the Secretary, seconded by J. E. MacLachlan, Esq.

The Manager, Gourepore Company,—proposed by J. Martin, Esq., seconded by H. J. Leitch, Esq.

H. J. C. Turner, Esq., Calcutta,—proposed by J. Martin, Esq., seconded by G. L. Kemp, Esq.

Surgeon-Major J. J. Monteith, M. D., Civil Surgeon, Silchar, Cachar,—proposed by the Secretary, seconded by J. E. MacLachlan, Esq.

Charles Maries, Esq., Durbhunga,—proposed by Baboo S. P. Chatterjee, seconded by the Secretary.

G. Fox, Esq., Guhmer,—proposed by Cairns Deas, Esq., seconded by G. L. Kemp, Esq.

Re-joined—H. H. the Maharajah of Munipore, K. C. S. I., and T. E. Coxhead, Esq., C. S., Burdwan.

CONTRIBUTIONS.

Tropical Agriculturist, Vol. III, No. 12 and Vol. IV, No. 1, of June and July 1884. From the Editor.

The Sugarcane, No. 179, Vol. XVI and No. 180, Vol. XII, of June and July 1884. From the Editor.

Indian Forester, Vol. X, Nos. 6 and 7, of June and July 1884. From the Editor.

Journal of the Asiatic Society of Bengal, Vol. LIII, Part II, No. 1, of 1884. From the Society.

Proceedings of the Asiatic Society of Bengal, Nos. IV and V, of April and May 1884. From the Society.

Annual Administration Reports of the Forest Department, Southern and Northern Circles, Madras Presidency, 1882 and 1883. From Government of Madras.

Transactions of the Asiatic Society of Japan, Vol. XII, Part II. From the Society.

Memoirs of the Geological Survey of India, Ser. XIV. From Government of India.

Review of the Forest Administration in British India for the year 1882-83. From Government of India.

International Meteorological Observations taken simultaneously, for the months of April 1883 and March 1884, prepared by the War Department, Washington, United States. From Government of India.

Returns of the Rail-borne Traffic of Bengal during the quarter ending the 31st March 1884. From Government of Bengal.

Report of the Bijnor Agricultural Society for 1883-84. From the Society.

Administration Report on the Jails of Bengal for the year 1883. From Government of Bengal.

Report on the Measurement of Rates of Growth of Casuarina in the Nellore District. From Government of Madras.

1½lb. Dodonaea seeds. From Superintendent, Botanical Garden, Saharunpore.

A packet of yellow Convolvulus seed. From Walter Campbell, Esq., Chaibassa.

2lbs. Mahogany seeds. From Superintendent, Royal Botanical Garden, Calcutta.

10 pods of Tacsonia. From John Starkitt, Esq., Hope Town, Darjeeling.

32lbs. of Divi-Divi seed. From Dr. R. A. Barker, Doomka.

The best thanks of the Society were voted for the above contributions.

COMMUNICATIONS.

From Major-General Sir H. Macpherson, referring to the notice in the Proceedings for June of a communication from Colonel Stewart, regarding the acclimatisation of Sumach in India, and applying for some seed to experiment with in Dehra Doon and Mussoorie. The small quantity of seed received from Colonel Stewart having been sown, there was none available to meet Sir Herbert Macpherson's application; some will be procured for experimental cultivation at an early date.

From C. Peterson, Esq., Puncah, asking for a working model of a native Kolhu, or oil-mill, as a pattern to make a mill upon, a model on a scale of $\frac{1}{3}$ rd was sent to Mr. Peterson.

From Colonel W. Kincaid, Schore, for seeds of Tree Tomato (Cyphomandra Betacea), Willoughbeia (Caoutchouc,) and Mahogany, to sow experimentally at an elevation of 1,650 feet above the sea, also for seeds of grasses. The seeds applied for were sent together with that of Tricholoma Rosea, and Reana Luxurians. Very little information regarding the former grass being available, Colonel Kincaid has been asked to favor the Society with a report as to its success. The grass is said to be well suited to dry localities.

From F. d' A. Vincent, Esq., District Forest Officer, Nellore, Madras, for Prosopis juliflora seed, in reference to this tree a note was published in the Proceedings for April. Mr. Vincent remarks: "the tree should do well in this district, and any one introducing a tree that would flourish on this dry and barren laterite would be a great benefactor." A small quantity of seed was sent with a request that a report might be furnished to the Society.

From Major Engledue, for a supply of Eucalyptus seed, to plant to the Windward of the Dacca and Mymensingh Railway European Staff's quarters, to break the unhealthy wind. Complied with.

From H. Kindler, Esq., Consul for the Austro-Hungarian Empire, stating that he had been referred to this Society by the Secretary to the Agricultural and

Revenue Department of the Government of India, for copies of this Society's Journal, Vol. VII, No. II, containing a note and report on fibre-cleaning machines, which will be of great interest to his Government. Complied with, with great pleasure.

Captain A. C. Talbot, Political Agent, Bikanir, in reply to a request from the Society, agrees to make experimental cultivation of Reana Luxurians and Tricholoma Rosea, and report the result. Captain Talbot kindly adds that he will be glad to be of any service to the Society, in experiments of these sorts.

From Thomas Mosley, Esq., Gibraltar, acknowledging receipt of some creeper seeds including Antigonon leptopus. Mr. Mosley mentions that some years ago he received seeds of this last from Singapore, but only raised one plant out of a large number of seeds, after struggling for some years this plant burst into bloom and was greatly admired, so the seeds he received from the Society were much sought for. He goes on to say—"I have been enquiring about capsicum seed, but find that every one has planted their seed, but a crop is due next month, there will be no difficulty in getting the quantity you require when this has been gathered." In a later letter Mr. Mosley writes:—"By last week's mail I sent you some newly gathered geranium and pelargonium seed, which I trust you will receive safely, I also included a few seeds of what we call here the Judas tree (*Cercis Siliquastrum*), it has graceful foliage, and bears clusters of pretty mauve flowers about the beginning of Lent, hence the name. I am on the look out for some Capsicum seed for you."

Mr. Middleton writes from Assam regarding Ceara Rubber (*Manihot Glaziovii*), Vanilla, Divi-Divi and Cardamoms, this last has been a failure hitherto, but the Rubber has grown well and promises to be a success. The Vanilla is also favorably reported on, the longest of the plants having grown some two feet since being planted out, they have only required watering on one occasion. The Divi-Divi too seems to do well, the two years' old plants being very tall. The last batch of seeds came through within four days of being sown.

Calotropis gigantea.—The Private Secretary to His Highness the Maharajah of Benares in referring to notices in late Proceedings regarding the medicinal qualities of this plant, mentions that in Benares the juice of the flower with some other ingredients is made into pills for Cholera.

COHESION OF TEA LEAVES.

Mr. F. C. Wyman, of the *Tea Gazette*, sends a specimen of two Tea-leaves subjected to this change, in acknowledging the receipt of this interesting specimen, the following extract from Dr. Master's Vegetable Teratology was sent to Mr. Wyman:—

"Cohesion of several organs by their margins, leaves, &c.—The union of the margins of two or more different organs is of more common occurrence than the preceding, the leaves being frequently subjected to this change. Occasionally,

the leaflets of a compound leaf have been observed united by their margins, as in the strawberry, the white trefoil, and others. Sometimes the union takes place by means of the stalks only. In other cases, the whole extent of the leaf becomes joined to its neighbour, the leaves thus becoming completely united by their edges, although usually the lower portions of the leaf are united together, leaving the upper parts more or less detached, there are some instances in which the margins of the leaf at their upper portion have been noticed to be coherent, while their lower portions, with their stalks, were completely free."

The Tea-leaf sent by Mr. Wyman is an example of the former condition.

TUSSER MOTHS.

Mr. J. Cleghorn, of Arrah, writing on the subject of Tusser Moths makes the following interesting remarks :—

" I did not purchase the cocoons for breeding. I purchased a lot of live cocoons, cut out the chrysalis and weighed the shells. I kept no chrysalis unless the shell weighed over 27 grains. The chrysalis I kept in bran, and as the moths came out paired them. I found in some cases that a single male paired four times with different females. All the males I had, paired at least twice before they died. I am very sorry I did not hear a week ago that you wanted eggs, I could have supplied you with several thousands. Within the last three days over four thousand eggs have hatched, and as the worms came out I let them crawl on to a *bair* branch, and then sent the branch off to villagers to attach to *bair* trees near their houses. I am quite out of the Tusser district, so I do not know how the experiment will answer. I am keeping about 500 worms, and am going to try and see if I can rear them in a large cage under the eaves of the verandah, and should be very much obliged if you will give me some hints.

I may as well tell you that I have watched moths escaping from the cocoons, and I feel certain that the solvent issues from the head of the moth, and not from the mouth, and that it does not separate the filaments with its feet, it *pushes* itself through, and uses its claws to drag itself free of the shell by purchase on an object independent of the cocoon. The filaments do not cross where the moth emerges, I have proved this by drawing out a chrysalis with a cork-screw from a half softened cocoon, and then reeled off the cocoon from *inside* without a break. The legs of the moth are doubled up, and cannot be used until it is well out of the shell; if the moth frees its legs whilst in the cocoons, it will entangle itself and never be able to escape. This accounts for a number of dead moths in cocoons. I just mention my observations as you may be interested in the matter.

The eggs, I am sending, are from the largest and heaviest cocoons that I could get, and you might keep them separate. I have only a few chrysalis left, but I

hope to be able to send you at least one thousand more eggs. I am afraid that some of these now going will hatch on the way."

In a subsequent letter Mr. Cleghorn says:—"I have placed some worms on Teak, Sisoo, and Beir, (*Tectona grandis*, *Dalbergia Sisoo*, and *Zizyphus Jujuba*), and they are all doing equally well, nearly all have shed their first skin. * * I find a ring of birdlime placed round the trees, the best means of keeping ants, lizards, &c., from getting to the worms."

The eggs received from Mr. Cleghorn were sent to Mr. F. St. C. Grimwood, North Lakhimpore, who is interested in an experiment to cross-breed the Tusser with the Muga Moth, the result of which he will communicate in due course.

ACCLIMATISATION OF ENGLISH VEGETABLE SEEDS.

The Dewan Lakhpat Rai, Secretary to His Highness the Maharajah of Kashmir under date 28th June, writes as follows:—

"I have the pleasure to advise the despatch of a packet of acclimatised English vegetable seeds, as per list annexed herewith, by to-day's post, and to request that you will have the kindness to allow a plot in the Society's Garden for their experimental cultivation, and to inform me of the result."

I have every reason to believe that the seeds will prove a success as they were grown under a favorable climate and temperature, and great care was taken in their fertilisation."

The list includes Cauliflowers, Beet, Celery, Tomato, &c., all of which will be carefully tested during the coming season, and a report published.

EARLY AMBER SORGHUM.

Mr. F. J. V. Minchin, of Aska, in applying for some Sorghum seed to make an experiment, with on a fair scale, writes:—

I have with me an Austrian gentleman who has had much experience in planting of Cane and Sorghum, and I am desirous of giving the Sorghum a fair trial this season as a Sugar-yielder. In the small experiments I have already made, I appear to have beaten any thing your friends in the north have done. Mr. Turner also kindly analysed my Rab with the following results:—

		Planter's Friend.	Sorghum.
Cane Sugar	...	74	78
Glucose	...	9.42	8.78
Moisture	...	4.52	4.84
Insoluble	...	2.26	3.16
Extractive	...	4.92	4.20
Ash	...	2.26	2.74
Salts	...	2.62	3.28
		—	—
		100	100

just 50 per cent. obtainable Sugar I believe by his method of calculation.

The following figures may be of interest to you, and I may mention that the stalks were pressed and the Rab made *in the middle of the rains*, viz., between 22nd September and 9th October 1881:—

Stalk cut	...	...	5,296
Weight	...	...	7,560 lbs.
Juice yielded	...	...	3,021 „ = 40% on weight.
Gallons	...	...	275
Goor	...	...	546 „ or 2 lbs. Goor per gallon juice, or over 7% on weight of stalks.

If you can procure me enough seed for the experiment, I will diffuse the stalks in my new diffusion apparatus just out from Vienna, and advise you of the result.

In a further communication acknowledging the receipt of the seed applied for, Mr. Minchin remarks:—"I sowed some at once and am glad to say it is already up; I will bear in mind your suggestion as to selection of the seed, but this season we are too poor to reject any of it; with your kind help and that of our Madras friends I think, we shall succeed in getting enough for the diffusion experiment. We have also applied to the Government of India and to friends in Bombay, and in anticipation of their aid and of your succeeding in giving us further help, I am keeping some acres of land ready here." A circular letter has been addressed to the gentlemen to whom seed was entrusted for trial, asking their aid to secure acclimatised seed, as Mr. Minchin's experiment should be a crucial test of the advantages of cultivating Sugar Sorghum in India; sufficient time has not yet elapsed to receive replies from all, but Captain Morris writes from Saugor, C. P.—"I am sorry to say the Sorghum did not succeed, though this was through no fault of the seed, which mostly germinated and grew quickly, but unfortunately some buffaloes broke into the garden and ate down the whole crop in the night. I left the crop in the ground, and since the rains some of it has come up again, but I doubt if it will come to any good."

The Koer Jai Narain Singh, of Didwarry, writes as follows:—

"I am sorry I could not acknowledge your letter sooner, owing to my long absence from this place on a pilgrimage to Budri Nath. Before going, however, I had the Early Amber Sugarcane sown, and they are now standing in good condition up to a height of nine feet. I hope they will be fit for pressing in November, when I will let you have the samples of Goor or Rab that will be made from them.

Captain F. Pogson desired me to sow them in February by way of experiment, and I did so, but the seeds did not germinate well, and the few stalks which appeared above the surface dried up in April in spite of well irrigation.

As desired, I beg to send you 1½ seer of acclimatised Early Amber Sugarcane seed which I had in hand."

MUSA TEXTILIS.

The previous experiment with *Musa Textilis* having resulted in a failure, a further supply of five plants have now been received from the Officiating Superintendent of the Royal Botanical Gardens, Seebapore, of these two shoots are from Madras and three from the Andamans, all have been planted in different portions of the garden, and are as yet looking healthy.

MOWHA (BASSIA LATIFOLIA) SUGAR.

In the Proceedings for May, some enquiries on this subject by J. Ragunath Mahadeo Kelker, Baroda, were noted, a sample of the material was duly received, and Messrs. Turner Morrison & Co. kindly furnished the Society with the report given below. The Society are greatly indebted to this firm for the courteous way in which they have so frequently furnished analyses on samples submitted to them, and for their careful and valuable reports and suggestions :—

"We have examined the sample of "what is called Mowha "Jaggery," but which is really nothing more than a highly-burnt Treacle, and we beg leave to report as follows :—

By analysis it contains—

67.20	per cent. of Glucose.
9.72	" " Moisture.
1.06	" " Insoluble.
18.96	" " Other Organic.
3.06	" " Ash, including Salts.

100

You will observe that there is not even a trace of "Cane" or "Crystallisable" Sugar; so that if the Mowha tree can produce nothing better than this sample, it is unfortunately quite worthless for Sugar-making.

We have, however, already noticed its highly-burnt character, and under such treatment all Crystallisable Sugar would naturally be destroyed. Perhaps the sender would favor us with a packet of the flower (or Saccharine part of the tree) gathered fresh in dry weather and hermetically sealed. We would then extract the juice and ascertain if it contains Cane Sugar in any proportion sufficient to pay for manufacture. We confess that we shall expect to find it with the Mowha as with several sweet fruits, *viz.*, that its Sugar is chiefly or altogether Glucose."

SEED WHEAT.

From the Private Secretary to His Highness the Maharajah of Benares :—His Highness the Maharajah was much interested in Captain Pogsou's paper regarding Indian Wheat and its improvement, and will feel extremely obliged by your being good enough to supply him with a seer, or two lbs. of each of the kinds mentioned below before the sowing season commences, and letting me know

the charges. Captain Pogson mentions saltpetre as a good manure for wheat. His Highness would like to know the quantity and method of application." The Deputy Secretary communicated with Captain Pogson in reference to this letter, who replys as follows: "I am glad His Highness the Maharajah of Benares has indented for the Wheat seeds, but they will not succeed under that latitude. At Benares all Wheat has been cut in March when punkhas and tatties begin; the only European Wheat which might succeed in Benares is the 60 to 90 days Polish Wheat (*Triticum Polonicum*.) In my Hindi Manual of Agriculture full information will be given on the use, and application of Nitre as a manure."

VANILLA.

A long and exhaustive paper on the cultivation, plucking, and preparation of Vanilla, according to M. Delteil's pamphlet is contributed by Mr. T. Langlois. The information given includes the cultivation, gathering of the pods, preparation with boiling water, sunning, straightening, sorting, packing, and will be of much use to those interested in the cultivation of Vanilla; it is therefore transferred to the Journal, and the best thanks of the Society are given to Mr. Langlois for his able and useful paper.

MAIZE.

Messrs. Lloyd & Co. in forwarding some very fine samples of Maize each $10\frac{1}{2}$ inches long and 7 inches in circumference in the middle, write:—

"We forward herewith two cobs of Maize grown by the Central Terai Tea Company at Semulbootia from Australian seed obtained at the late International Exhibition held here. Although the cobs are not of an extreme length, the circumference is a fair good size, and we think the grains will weigh out well in comparison with any grown in the country from imported seed. •

We distributed several lots of the same seed among other planters both in the Hills and the Terai, and on receipt of further specimens we shall be pleased to forward them to you, for the information of the Society.

The specimens were of such great size both in cob and grain for country-grown Maize, that Messrs. Lloyd & Co. were asked for further information as to the culture, &c., they had experienced, and their reply is as follows:—

"Referring to our letter of 26th instant and your reply of same date, we are now enabled to give some particulars as to the treatment the Australian Maize seed received at the Central Terai Tea Company's Garden, Semulbootia. The Manager writes as follows, in reply to our queries:—"I am glad the cobs of "Maize I sent you have given such satisfaction. The land on which the seed "was planted was not manured, but there had been cooly lines near some of "it last year."

"It was planted out in the beginning of May 2 ft. by 2 ft., not manured."

"Some of the plants had two or three cobs on each, but not all of the same size; if three, one large and two small, and if two, one large and one small.

"It was weeded three times and some of it watered, but I don't think this was necessary."

"It would take about 10,890 seeds to plant an acre, or 19 to 20 cobs, if planted 2 ft. by 2 ft."

"Most of the cobs are like those I sent, and I am inclined to think they will be finer next year if the rainfall is better."

Though almost every year samples of Maize have been received from members in various parts of India, few if any, specimens have been finer than those sent by Messrs. Lloyd & Co., and it will be most interesting to note if the seed of this year's produce will maintain the good qualities of the stock. Should this be the case, still better results may be looked for, and with careful selection of seed and the use of manure, a very high class of seed Maize could be made available at much cheaper rates than it has been hitherto possible to lay down imported Maize, grown especially for seed in America. That this good seed would be appreciated if distributed through proper channels and to the proper class of cultivators, is evident from the fact that in a village in Arrah where good seed was distributed 15 years ago, a good class of Maize is still cultivated throughout the village, appreciably different from the common kinds grown elsewhere in that district.

Captain Morris, of Saugor, C. P., writing regarding Maize, says:—

"I sowed American Maize last year in the rains, and was most successful with it; most of the stalks had three or four heads, I have supplied many of the Kachis in the neighbourhood with acclimatised seeds."

Wednesday, the 27th August 1884.

W. H. COGSWELL, Esq., *President, in the Chair.*

THE Proceedings of the last Meeting, held on the 30th July last, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected as
nary Members:—

The Manager, Burhoga Factory, Sarun.

James J. Jellicoe, Esq., Deputy Conservator of Forests, Gouhatie.

W. B. Colville, Esq., Merchant, Calcutta.

The Manager, Tingri Tea Company, Limited.

The Manager, New Terai Association.

The Proprietor, Nahor Rani Tea Estate.

The Manager, Nilgiri Raj, *vid* Balasore.

The Manager, Gourepore Company.

H. J. C. Turner, Esq., Calcutta.

Surgeon-Major J. J. Monteith, M. D., Civil Surgeon, Silchar, Cachar.

Charles Maries, Esq., Durbhunga.

G. Fox, Esq., Guhmer.

Rejoined—Captain D. W. K. Barr, Political Agent, Sutna, E. I. Railway.
G. B. Dalton, Esq., o. s., Julpigorie.

CONTRIBUTIONS.

Tropical Agriculturist, for August 1884. From the Editor.

Indian Forester, Vol. X, No. 8, August 1884. From the Editor.

Proceedings of the Asiatic Society of Bengal, No. VI, of June 1884.
From the Society.

Records of the Geological Survey of India, Vol. XVII, Part 3. From
Government of India.

International Meteorological Observations taken simultaneously, for the
months of July, August, September, and October 1882, and for the month of
May 1883. Prepared by the War Department, Washington, United States.
From Government of India.

Monthly Weather Review, for October and November 1883. Prepared by
the War Department, Washington, United States. From Government of India.

Report of the Chief Signal Officer, Parts 1 and 2 of 1883. Prepared by
the War Department, Washington, United States. From Government of India.

Proceedings of the Agri-Horticultural Society of Madras for July 1884.
From the Society.

Report of the Acclimatisation Society of Queensland for the year 1883.
From the Society.

Report on the Progress and Condition of the Government Botanical Gardens
at Saharanpore and Mussoorie, for the year ending 31st March 1884. From
the Superintendent, Government Press, Allahabad, N.W. Provinces.

The Petition of the Ryots of Bengal for the Restoration of the Permanent
Alement of Land Laws. From John Stalkartt, Esq.

Report on the Nagpore Experimental Farm for 1883-84. From the Chief
missioner, C. P.

A quart of Acclimatized Cauliflower seed. From C. Maries, Esq.

Two bottles of Aster seed. From G. Nickels, Esq., Jaunpore.

A packet of six varieties of fruit seeds from Guayaquil, Ecuador. From A.
Dawson, Esq., Calcutta.

COMMUNICATIONS.

From W. Sarson, Esq., Chittagong, dated 3rd August 1884. In fulfilment of
my promise I have requested Messrs. T. Black & Co., my agents, to hand you a
hundred cigars made of the Tobacco, the seed of which you kindly sent me last
year. The leaf of the different kinds unfortunately got mixed up by the coolies
in picking and curing. I have had the cigars made up in Calcutta, they are
quite fresh, and do not draw freely because they are so damp. I think if they
were put by sometime and allowed to age they would not be bad cigars.

however I should like your opinion and that of other members of the Society on them. The Tobacco was cured in the same way as that on which Mr. Cabannis, of Burmah, pronounced so favorably last year. The cultivation, curing, &c., have been expensive and it would never pay to sell in the Bazar for native smoking. It would not pay to sell these cigars under Rs. 4 per hundred.

An application from J. de la Mare, Esq., Agent for the Mauritius, for samples of certain Indian Raw Sugars, for the Intercolonial Sugar Exhibition to be held in Mauritius; through the kind offices of Messrs. Turner Morrison & Co., samples have been forwarded to Mr. de la Mare, although this is a most unfavorable time of the year for collecting these products.

From Claude Dumaine, Esq., forwarding sample of oil made from the seed of the Simal tree (*Bombax Malabaricum*), Mr. Dumaine writes in reference to the oil, that it does not appear to be known, and that he would like to know the use it can be put to; he adds:—"the natives fry the Simal seed and eat it with *Monah*; they say it acts as a strong purgative." Mr. Dumaine has also forwarded a sample of a Cotton, of which he says not much use is made, he would like to know its Botanical name and usqs. He has been requested to send some of the leaves of the plant yielding the Cotton for identification.

From E. C. Whitehead, Esq., Bagracote Tea Estate, Silliguri, reporting the germination of some of the Carob seeds sent to him, and of the Reana luxurians, the cattle have not, however, allowed the letter to grow to any height, having grazed it down more than once.

Captain A. C. Talbot, Political Agent, Bikanir, reports that the Reana luxurians sent him for trial has come up, but the Tricholoma Rosea seed has not germinated. A further supply will be sent as this grass is said to be well suited to dry localities.

AUSTRALIAN MAIZE SEED.

In continuation of their correspondence on this subject, Messrs. Lloyd & Co. have forwarded five cobs of Maize grown on some of the gardens in agency, and have kindly placed their Managers' letters at the disposal of Society. Although some of the cobs are very fine, particularly those grown Adulpore, in which the grain is very large, on the whole none are equal those exhibited at the last meeting by Messrs. Lloyd & Co., grown at Sem bootia, in the Central Terai Tea Company, a notice of which appeared in the last Proceedings.

Mr. Moneypenny writes from Adulpore, Terai Tea Co.:—I received three cobs of Maize very much weevil eaten, and, put down the seeds after the first showers, 2 x 2 feet in my vegetable garden, in soil that had previously received a dressing of stable manure. The seeds that were not weevil eaten, germinated well and grew fast, and I have now some fifty cobs, some as good, and some nearly as good as the samples sent, besides a number of inferior ones. I find that many of them have not set the grain properly, and have one cob over a foot

long with only some thirty grains on it, had it set properly it would have been a splendid specimen; perhaps the Agri-Horticultural Society can suggest a reason for the grain not setting, and a remedy.

Mr. Finlayson, of the Puuchanai Tea Estate, observes that when there was more than one cob to each stalk, they were not well grown.

The Manager of Dumsiri writes, that although the crop was a poor one, there are some fine specimens of cobs; the soil was old Forest-land, cleared some seven years, top dressed with cow manure and the seeds were sown nine inches apart on ridges; he thinks the planting was too close and the ridging a mistake. A little liquid manure was given to the plants.

Mr. Mills, of Chenga Tea Company, Panighatta, mentions that the seed was badly weeviled consequently the crop was thin, it was sown in black friable loam and well manured with cow-dung. He adds that there are from two to five cobs on each plant, some of them being equal in size if not superior to the parent stock.

Mr. Curtis, Ting Ling Tea Co., Panighatta, reports that the average number of cobs on his plants was $1\frac{1}{2}$; the seed was planted on clayey soil, on a gentle slope 2×2 feet; half was manured with old cow-dung, and half not manured.

Mr. E. C. Whitehead, Bagracote Tea Estate, Silliguri, sends some specimens, but they are inferior to those shown by Messrs. Lloyd & Co., he writes as follows:—You gave me a few seeds last cold weather, I planted them in the beginning of May last and nearly all germinated; they were planted 1×1 foot on poor soil, not manured. I have not been able to send you the biggest cobs as they were shelled. Those I send are not very large, but considering the seed was planted on poor soil and much too close together, I do not think the Maize has done badly. I would like to get a small quantity of extra good seed to try next year. I intend distributing the acclimatized seed amongst the natives here, who are anxious for some.

INTERCHANGE WITH THE COLONIES.

Mr. Thomson, Esq., Secretary to the Royal Commission for Victoria to the International Exhibition, writes on the 29th July, forwarding the report of the Commission, in which presentations of seeds from this Society, Produce Samples from Messrs. W. Haworth & Co., and bags and gunny cloth from Messrs. Apcar & Co., are acknowledged.

Mr. Thomson also forwards two newspapers, the *Age* and the *Daily Telegraph* which contain reference to the Society, and extract of the Deputy Secretary's letter to Mr. Thomson. Mr. Thomson states that he is "arranging with some of the Societies to exchange publications, &c., with you."

Friday, the 31st October 1884.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting, held on the 27th August last, were read and confirmed.

The names of the following gentlemen were submitted as desirous of joining the Society :—

Baboo Preo Nauth Mittra,—proposed by Baboo Ram Narayan Chatterjee, seconded by Baboo Protapa Chundra Ghosa.

H. K. Stephen, Esq., P. W. D., Gopalgunge, Sarun,—proposed by John Hodding, Esq., seconded by John Martin, Esq.

J. H. Livermore, Esq., Lakanhatti, Malanchi Station, N. B. S. Railway,—proposed by Thomas Brae, Esq., seconded by G. L. Kemp, Esq.

The Manager, Khobong Tea Company, Limited,—proposed by H. J. Leitch, Esq., seconded by the Deputy Secretary.

W. C. Gibson, Esq., Advocate, Kyowktan Syrian, British Burmah,—proposed by the Deputy Secretary, seconded by G. L. Kemp, Esq.

H. H. The Maharajah of Rewah, Sutna, E. I. Railway,—proposed by Major D. W. K. Barr, seconded by the President.

The Manager of Saddawa Indigo Concern, Sewan, Sarun,—proposed by John Hodding, Esq., seconded by F. W. Blechynden, Esq.

Captain T. Morris Jenkins, Toungloo,—proposed by W. Pigott, Esq., seconded by John Martin, Esq.

H. H. Pertap Udai Nath Sahi Deo, Maharajah of Chota Nagpore,—proposed by F. Collinson, Esq., seconded by Baboo Protapa Chundra Ghosa.

T. Henderson, Esq., Saloua Nowgong, Assam,—proposed by the President, seconded by G. L. Kemp, Esq.

F. P. Haiuworth, Esq., via Lahoul, Dibrughur,—proposed by [the] President, seconded by S. H. Robinson, Esq.

J. E. Leslie Huddleston, Esq., Assistant, Meesa Garden, Kelly Den Tea Estate, Assam,—proposed by H. J. Leitch, Esq., seconded by the President.

Baboo Tarini Churn Ghosa, B. L., Zemindar, Paikpara,—proposed by Baboo Protapa Chundra Ghosa, seconded by Rajah Suttyanundo Ghosal Bahadoor.

Charles Still, Esq., Sathie Factory, Chinputia, Bettia, Tirhoot State, way,—proposed by the Deputy Secretary, seconded by F. W. Blechynden,

Life Member.—General Dhoje Narsingh Bahadoor, Rana, Nepal.

Honorary Member.—J. Wood-Mason, Esq., Deputy Superintendent, India Museum,—proposed by the President, seconded by G. L. Kemp, Esq.

CONTRIBUTIONS.

Tropical Agriculturist, for September and October 1884. From the Editor.

Indian Forester, Vol. X, Nos. 9 and 10, of September and October 1884. From the Editor.

The Sugarcane, Vol. XVI, Nos. 181 and 182, for August and September 1884. From the Editor.

Proceedings of the Asiatic Society of Bengal, No. VII, of July 1884. From the Society.

Journal of the Asiatic Society of Bengal, Vol. LIII, Part II, No. 11, of 1884.
From the Society.

Returns of the Rail-borne Traffic of Bengal during the quarter ending the
30th June 1884. From Government of Bengal.

Annual Statement of the Sea-borne Trade and Navigation of the Bengal Pre-
sidency, Vols. I and II of 1883-84. From Government of Bengal.

Report on the Progress and Condition of the Government Botanical Garden,
Saharunpore, for the year ending 31st March 1884. From the Superintendent,
Government Press, Allahabad, N.-W. Provinces.

A list of Agricultural Implements and Machines which have been experi-
mented with and found efficient and useful in India during the year 1883-84.
Five copies. From Government of India.

Memoirs of the Geological Survey of India, Ser. X, Vol. III. Two copies.
From Government of India.

Report on the Tea-Mite and Tea-Bug of Assam. From J. Wood-Mason, Esq.

Proceedings of the Agri-Horticultural Society of Madras, for August and
September 1884. From the Society.

A descriptive Atlas of the Eucalypts of Australia and the adjoining Islands,
7th decade. From Baron Von Müller.

Journal of the Bijnor Agricultural Institute, Vol. 2—1. From the Society.

International Meteorological Observations taken simultaneously, for the months
of November 1882, June and July 1883. Prepared by the War Department,
Washington, United States. From Government of India.

Monthly Weather Review, for May, June and July 1884. Prepared by the
War Department, Washington, United States. From Government of Bengal.

Report on the Administration of the Registration Department in Bengal, for
the year 1883-84. From Government of Bengal.

Thirty Avocado-Pear Seeds. From T. Brac, Esq.

Large packet of Scarlet Runner Bean Seeds. From John Stalkartt, Esq.

packet of Bocconia frutescens. From Director, Public Garden, Jamaica.

vo Hyacinth Glasses. From J. M. Sherman, Esq.

note on the Phyllanthus reticulatus Poiret, Syn. P. Multiflorus, Ross.

From C. Mansou, Esq. *Transferred to Journal.*

COMMUNICATIONS.

From T. W. Holderness, Esq., o. s., Under-Secretary to the Government of
India, forwarding five copies of a list of Agricultural Implements and Machines,
which have been experimented with and found efficient and useful in India
during 1883-84. The receipt of this useful list was duly acknowledged with
thanks.

From G. Takeda, Yokohama, Japan, forwarding a packet of *Rhus Succedanea*
seed, in the place of *R. Vernicifera* which he hopes to be able to obtain for the
Society next season.

The Private Secretary to H. H. the Muharajah of Benares making some enquiries regarding a preventive to white ants mentioned in this Society's Proceedings for December 1881. The preventive alluded to was handed to Messrs. Octavius Steel & Co., who, in reply to an enquiry, addressed to them by the Deputy Secretary, regret that they have no report on the experiment, and that the Manager through whom it was made is now in England. Messrs. Octavius Steel & Co. add "there is in our experience no better preventive against white ants than the now well known remedies of kerosine, phenyle, and in a less degree charcoal dust."

From A. C. Sturrock, Seed and Plant Merchant, Melbourne :—

"Seeing by some of our newspapers that you are desirous of assisting us in the Australasian Colonies, in procuring forage plants that we consider would be likely to be valuable here, I feel encouraged to ask if you could procure for me a bag of grass seed. It is called *Huriilee* Grass, and an old Indian Officer has stated that it will do well here. If you can attend to this matter I will be most happy to reciprocate in any way you require, either by a cash remittance, or in seeds of Australian trees and shrubs, but in any case please to give the seed a money value for entering at our Custom House, also inform me whether it is procurable in quantity, if it should prove a success."

There appears to be some confusion about the name "Haryali," it is said to be one of the names for Dúb (*Cynodon Dactylon*, *Pers.*) as soon as the grass is identified, seed will be sent to Mr. Sturrock in response to his application.

From J. G. Worth, Esq., Mullanoor, Coonoor, Madras Presidency, for seed of *Prosopis juliflora*, as he is of opinion that the tree might be successfully grown on the Nilgiris on the red ferruginous soil too poor to carry tea, coffee, or even fodder, and on which he has not succeeded with Guinen, or Mauritius grasses. Some seeds were sent to Mr. Worth together with a supply of *Tricholæna Rosea*, or Natal Red Grass Seed, as it is said to grow well in dry localities. Mr. Worth, however, reports, that both sorts of seeds had failed to germinate, although for six weeks. As some of the *Tricholæna Rosea* sown in the Society's garden at Alipore has grown and flowered, another supply of seed will be for trial at Coonoor.

Mr. Henry G. French, of Chaoramun, writes as follows :—

"I have the pleasure to inform you that the Australian Maize you sent me has been a success, I gave some to my European and native neighbours. Each stem bore three cobs, and they were fine eating. The best country Indian corn, I have ever seen is from the Rajmehal hills, the cobs are from 10 to 12 inches long, and the corn perfect."

From Colonel J. J. Boswell, Srinugger, Cashmere, forwarding two berries and leaves of a plant found growing in the hills near the Solat Valley, at an elevation of about 7,000 feet. The fruit is very like the ordinary Tipparee (*Physalis Peruviana*.)

Through the courtesy of Mr. Brace, of the Royal Botanical Garden, Seebapore, the specimens were identified as *Physalis Alkekengii* (Lin.) known as the winter cherry or strawberry Tomato, a hardy herbaceous perennial, a native of Southern Europe.

From the Dewan Lakhpur Roy, Secretary to His Highness the Maharajah of Cashmere, who sends a root of a native plant for identification, he writes :—"It is locally known as "Jungle Adrock," and it grows in the snowy vallies of the Himalaya, as snow commences to thaw the rhizomes start, and sprout lanceolate leaves sheathed on the stem greatly resembling, but much larger than those of the "Zingiber Officinalis." The data given is unfortunately not sufficient for identification, so the Dewan has been asked to send specimens of leaf and flower, as a further aid.

From T. W. Holderness, Esq., c. s., Under-Secretary to the Government of India, acknowledging the receipt of a copy of this Society's Proceedings for 27th August last, and asking for a sample of the cotton alluded to therein as forwarded by Mr. Dumaine. A further supply has been asked for from Mr. Dumaine to meet this request.

From H. H. Risley, Esq., Officiating Under-Secretary to the Government of India, requesting that 5lbs. of seed of each of the different varieties of tobacco cultivated in Bengal, be forwarded to the Political Agent, Kholapore. The seed is required for experimental cultivation in the native states in that agency. The Deputy Secretary communicated with several Members of the Society requesting their assistance. Mr. Brae, of Majepara, Purnia, states that though Tobacco is little grown in his neighbourhood, the following six varieties are cultivated in Rungpore :—1. Jara Bang. 2. Kalim Lator. 3. Pan Bhootio. 4. Hati Kani. 5. Fukyn Kani. 6. Kalika Juba.

Baboo Protap Narain Singh has forwarded seed, of the following varieties
1. Bancoora, Hamakool, Hirghi, Panlokia.

Baboo Joykissen Mookerjee, of Uttarpara, has promised to send several varieties shortly.

RHEA FIBRE.

Several applications for information regarding Rhea have been received since the last meeting, owing, no doubt, to the attention excited by the late Fibre-machine trials held under the auspices of the Bengal Government. Such information as has been at the disposal of the Society has been afforded to applicants.

The following report on samples sent by Messrs. Begg, Dunlop & Co., prepared at Bareilly, was furnished by the President :—

"I have carefully examined the following samples of Rhea Fibre under a Coddington Lens, and have pleasure in reporting as follows: No. 1.—Fair to moderately long, soft staple, greyish white color, produced by the application of chemicals to bleach it, an excess of which has rendered most of the Fibre exceedingly weak and towy in appearance, so much so, that much of it would be

reduced to tow only in the combing process, to which it must be subjected in manufacture. No. 2.—Staple harsh, short, irregular, uneven, tender to somewhat weak in strength, little toowy, and of but poor color, some sticky with original bark adhering, and not freed from gumminess.

With care and greater experience, which can only be gained by repeated trials, these samples indicate that much better results may be achieved.

In this country no commercial value can be attached to them, but if further preparations were submitted, freed from the objectionable features I have pointed out, I would recommend that large samples be sent to London for a full report and valuation thereon."

(Sd.) W. H. COGSWELL.

Hitherto on this side of India all the Rhea grown has been propagated by cutting, and division of roots, as the seed has never proved fertile. The following communication is therefore of great interest, as should Rhea be largely cultivated, the slow process of propagation by cuttings would prove expensive, and a great obstacle to the industry getting a fair start, as the stock of plants available for the purpose is limited:—

"The small packet of Rhea Seed I left with you on the 25th instant, was obtained from plants grown in my garden, and they again were propagated from imported seed.

As it will be interesting to the public to know that acclimatized seed germinates out here, you will be good enough to announce the fact in an early issue of the Society's Journal."

Yours faithfully,
A. M. GOW-SMITH.

MOWWA (BASSIA LATIFOLIA) SUGAR.

Note by Captain J. F. Pogson.

In the Proceedings of the Agri-Horticultural Society, dated 30th last, there appears an interesting communication on the above subject.

There are three varieties of this tree, viz., *Bassia longifolia*, *B. butyracea* and *B. latifolia*. The fruit of the first, by expression, yields a large quantity of oil, and of the last the petals of the flowers contain sugar whilst the second yields what is called "fulwa butter," (? *Ghee*) which is a soft solid at 95° F. The fruit of the *Mohwa*, yields oil abundantly. (*Vide The Bengal Dispensatory*, p. 428.)

The flower petals of the *Mohwa* being sweet indicates that the rising sap of the tree in spring, and just before the flower buds swell, must be rich in saccharine matter, and if so, tapping the *Mohwa* trees in the same manner that the Sugar Maple (*Acer saccharinum*) of North America, is tapped, may lead to the production of sweet sap, which on being boiled and concentrated, would yield sugar.

"The Maple tree sap, at first, is clear, colourless, and without taste, but after standing for a day or two it becomes sweet, and a few days after the sap has begun to run, it flows sweet from the tree. (*Vide The Chemistry of Common Life*, p. 197.)"

It would be well worth trying the experiment of tapping or bleeding, all three varieties, for their sap, and if this is found to contain true sugar, the discovery would be one of considerable importance.

If, however, in place of cane, or true sugar, the sap on concentration yields grape sugar or glucose, the produce under suitable manipulation should yield a good wine, and if fermented and distilled, a sound and pure spirit or alcohol.

"The four States of New Hampshire, Vermont, New York, and Michigan, produce together upwards of twenty million pounds of Maple Sugar," and if the Mohwa of all India can be made to do the same, a large and very profitable trade would be called into existence. I trust the publication of this short note in the Proceedings of the Society may lead to the suggested experiment being tried in different parts of India in due season, that is when the sap begins to rise in the trees mentioned.

J. FRED. POGSON.

WITHER BLIGHT. (*Transferred to Journal.*)

CATTLE SALT.

The following paper by Captain Pogson, regarding Cattle Salt, brings forward a matter of great importance, which it may be advantageous to ventilate:—
(*Transferred to Journal.*)

Wednesday, the 26th November 1884.

W. H. COGSWELL, Esq., President, in the Chair.

Proceedings of the last Meeting, held on the 31st October last, were read confirmed.

The following gentlemen, proposed at the last Meeting, were elected as Ordinary Members:—

Baboo Preo Nauth Mittra, Calcutta.

H. K. Stephen, Esq., P. W. D., Gopalgunge, Sarun.

J. H. Livermore, Esq., Lakanhatti, Malanchi Station, N. B. S. Railway.

The Manager, Khobong Tea Company, Limited.

W. C. Gibson, Esq., Advocate, Kyowktan Syrian, British Burmah.

H. H. The Maharajah of Rewah, Sutna, E. I. Railway.

The Manager of Saddawn Indigo Concern, Sewan, Sarun.

Captain T. Morris Jenkins, Toungoo.

H. H. Pertap Udai Nath Srihi Deo, Maharajah of Chota Nagpore.

T. Henderson, Esq., Salonah, Nowgong, Assam.

F. P. Hainworth, Esq., *via* Lahaul, Dibrughur.

- J. E. Leslie Huddleston, Esq., Meesa Garden, Kelly Den Tea Estate, Assam.
 Baboo Tarini Churu Ghosa, B. L., Zemindar, Paikpafra.
 Charles Still, Esq., Sathie Factory, Chinputia, Bettia, Tirhoot State Railway.
Life Member.—General Dhoje Narsingh Bahadoor, Rana, Nepal.
Honorary Member.—J. Wood-Mason, Esq., Deputy Superintendent, Indian Museum.

The names of the following gentlemen were submitted as desirous of joining the Society:—

W. H. Miles, Esq., 28, Dalhousie Square, Calcutta,—proposed by W. Mackenzie Bradley, Esq., seconded by the Deputy Secretary.

Manager, Jatinga Valley Tea Company, Limited, Cachar,—proposed by W. Mackenzie Bradley, Esq., seconded by the Deputy Secretary.

M. J. Deverinne, Esq.—proposed by the Deputy Secretary, seconded by R. Blechynden, Esq.

Rejoined.—H. W. Bruce, Esq., Tezapore, Assam; F. Schiller, Esq., Calcutta; G. S. Hayes, Esq., Purneah.

CONTRIBUTIONS.

Economic Products of India, 4 Vols., Parts I to VII. By George Watts, M.B., C.M., F.L.S. From Government of India.

Memoirs of the Geological Survey of India, Ser. X, Vol. III. From Government of India.

Report on the Internal Trade of Bengal, for the year 1883-84. From Government of Bengal.

Report on the Police of the Lower Provinces of the Bengal Presidency for the year 1883. From Government of Bengal.

Proceedings of the Asiatic Society of Bengal, Nos. VIII. and IX, for the months of August and September 1884. From the Society.

The *Indian Forester*, Vol. X. No. 11, of November 1884. From the Ed.

Proceedings of the Agri-Horticultural Society of Madras for October 1. From the Society.

Journal of the Bijuo Agricultural Institute, Vol. 1, No. 7, two copies. From the Society.

Annual Report of the Department of Revenue Settlement and Agriculture for 1882-83. From Government of Madras.

International Meteorological Observations taken simultaneously, for the month of August 1883. Prepared by the War Department, Washington, United States. From Government of India.

Monthly Weather Review, for August 1884, taken simultaneously. Prepared by the War Department, Washington, United States. From Government of India.

A box of Early Amber Sorghum Seed. From the Hon'ble T. M. Gibbon, C. I. M., Bettia.

A box of Early Amber Sorghum Seed. From W. Helps, Esq., Darjeeling.
Two cases of Ferns. From C. Maries, Esq., Superintendent, Durbhunga Raj Gardens.

A box of English Potatoes, containing 56 lbs. each of the following varieties:—Late Rose, Veitch's Ashleaf Kidneys, and Paterson's Victoria. From Bunyard, of Maidstone, presented by W. Stalkartt, Esq. *

The Society's best thanks are recorded for all the above presentations.

A large number of Chrysanthemums including the following varieties were exhibited by Mr. Maries, Superintendent of the Maharajah of Durbhunga's Gardens:—*Chrysanthemums*, Empress of India, Golden Empress of India, Tourville, Foulton, Fulgore, Lord Beaconsfield, Beauty, Eclatante, Madame Randaltey, Coeur, Venus, Aurora Borealis, Delicata, Rose Trevenna, Mons. R. Lariss, Beethoven, Yellow Marguerite, Tisiphore, Louis Bonamy, Madame Montello, Mrs. Wood, Nagasaki Violet, Model of Perfection, Rex Rubrorum, J. Hillier, Baron de Prilly, Duchess of Gerolstein, Golden Circle, Parasol, Sarnia, Marguerite, Dick Turpin and Pere Duclerc.

The flowers were fresh and in good condition, and were much admired.

Mr. G. Bartlett also exhibited several varieties of Chrysanthemums grown in Calcutta, he mentions that he has some eighty varieties in cultivation, but all are not in bloom yet. It is surprising that this very effective and handsome flower is not more generally grown in Calcutta. The notes on its cultivation kindly contributed by Mr. Maries will be found useful, and they are published with these Proceedings. A vote of thanks was recorded to Mr. Maries for his seasonable paper.

The Deputy Secretary reported that the English Potato seed presented by Mr. W. Stalkartt, acknowledged above, was received on the 6th instant, and small quantities of the different varieties have been sent to Bancoora, Buxa, Bhutan, parun and Katmandoo, some seed is still available to members who can it a fair trial, and will report results.

A curious case of abnormal growth in a Pumplenoise was exhibited by Mr. T. Smith. In reference to which Mr. Brace, of the Royal Botanic Garden, to whom it was forwarded, remarks:—"The Shaddock, Pummelo, or Pumplenoise fruit that you sent me is an instance of the repetition (said to be rare) of the Carpillary whorl, so that in the place of the normal single series there are two." Dr. Masters in his Vegetable Teratology alludes to similar cases under the head of Pleiotaxy, or multiplication of whorls, he observes that "the orange is one of the plants most frequently subject to an augmentation in the number of carpillary whorls."

COMMUNICATIONS.

From T. W. Holderness, Esq., c. s., presenting a copy in four Vols. of "the Preliminary Lists of the Economic Products of India," compiled by Dr. G. Watt. The Society's thanks were voted for this useful publication.

From C. Peterson, Esq., Puncah, Numaligarh Post Office, Assam, asking for an opinion on a small sample of Sorghum *Rab* prepared by him in the usual way. Mr. Peterson mentions that the weather was very warm when the Sorghum was cut, and that he has made another sowing to see how it will do in December and January. The sample sent has unfortunately been burnt in the boiling, and thus rendered unsuitable for sugar-making. Mr. Peterson's experiment if carefully conducted, and the percentage of yield in the hot and cold weather respectively recorded, will be of permanent value.

Mr. Dumaine, who a short time ago, (Proceedings for August,) sent a sample of cotton of which he desired to know the Botanical name, subsequently sent the leaf and bark of the tree which has enabled it to be identified as the *Cochlospermum Gossypium*. Mr. Dumaine writes:—"The tree is perfectly useless, if cut down and left on the ground it rots in a very short time, say three to four weeks. The wood even when split and dried, burns but slowly and emits a great quantity of smoke. So it is seldom cut down, and the cotton is not collected." Although the timber is valueless and its cotton not utilized, the handsome bright yellow flowers it bears makes it suitable for introduction into large gardens and parks. There is a good specimen in the Society's Garden at Alipore.

From J. J. Coles Hardinge, Esq., Secretary to the Agricultural and Horticultural Society, British Burmah, applying for 2 lbs. of imported maize seed, which has been forwarded.

From Messrs. Hoare, Miller & Co., who ask if the Society can procure about a bushel of bamboo seed for a correspondent of theirs, who is desirous of trying to establish the bamboo in the Greek Islands. In reply the Deputy Secretary stated that as the bamboo flowers infrequently and at uncertain intervals, the seed is not easily procured, and as more than one application had lately made for bamboo seed, he had, through the courtesy of the Honorary Editor, inserted a note in the September number of the *Indian Forester*, asking readers of that Journal to communicate with him, should any seed be procurable in the neighbourhood: As the Journal circulates amongst a body especially likely to learn of, and take an interest in the flowering of bamboos, it is hoped that should any seed be at present procurable, it will be made available.

In response to applications made to them to meet a request made to the Society by the Government of India, for a supply of Tobacco seed, Baboos Protab Narain Singh and Joykissen Mookerjee, and Mr. H. R. Reilly have obtained and sent seed of some nine varieties, which have been forwarded.

RHEA FIBRE.

Mr. Hennessy, the gentleman, who prepared the Rhea Fibre lately reported on by Mr. W. H. Cogswell (Proceedings, 31st October) has communicated with the Society again, both directly and through Messrs. Begg, Dunlop & Co., asking that a sample of Rhea Fibre such as would be considered first class in England

may be sent to him, as he has great hopes of making his process successful, but would like to have a standard sample as a guide as to what is required. The Society has met so many applications of this kind, that it has unfortunately at present no more material available for the purpose. Some will be procured and sent to Messrs. Begg, Dunlop & Co.

Mr. J. Cleghorn writes from Arrah regarding the rate of growth of Rhea ; some was planted by him about eight months back, and cut down close to the ground on the 19th of October when in flower ; on the 6th of November, 18 days after being cut, the plants were three feet high, and on the 28th of November, 40 days after being cut, they were four feet high and in seed. Mr. Cleghorn sends a leaf from one of these plants which measures $9\frac{1}{2}'' \times 7''$.

REANA LUXURIANS.

In a letter from Koer Jai Narain Singh, of Didwary, Meerut, to Captain Pogson, forwarded by that gentleman, mention is made of Reana Luxurians, which is reported as having done wonderfully well,—“ they braved all the heavy floods and are even now (19th November) perfectly green, and have grown to the height of 10 feet and more.” “ It makes an excellent fodder and the cattle show a decided liking to it.” The Koer’s experience agrees with that gained in the Society’s own Garden, and with Dr. Greenhill’s, of Messrs. Cook & Co., who has a high opinion of it. Further opinions are invited, as in the Saidapet Experimental Farm Report the summing up is very unfavourable. As the following extract will show :—

FODDER CROPS.

“ Of the fodder crops the best and at the same time most easily grown are Guinella-grass, Cumboo, and Horse gram. Buffalo-grass failed and is pronounced unsuited to this part of India. The same must now, I think, be finally said of Reana Luxurians, it grows luxuriantly and produces enormously, it requires a heavy rainfall and free irrigation ; it cannot stand a drought ; cultivation is expensive, its fodder watery, cattle starve on it, and it spoils milk. I do not think that any further experiments should be made h it.”

Captain Pogson renews his enquiry regarding the Japan Single Bullock Plough, which he thinks might be adapted for camel draught. The Deputy Secretary drew Captain Pogson’s attention to a paper on Chinese Agricultural Implements published in an early number of the Society’s Journal (Vol. III, Old Series), the Plough depicted in the illustration accompanying the paper is apparently yoked to the cattle with traces, and not as in India to a pole. The implement might be suitable for introduction into India, the following remarks are made on it :— “ The frame work is of wood, it comes to pieces, and the whole is so light that at even-time the labourer carries it home over his shoulder.”

CALOTROPIS FIBRE.

From T. W. HOLDBERNESS, Esq., C. S., Under-Secretary to the Government of India, to the Deputy Secretary of the Agri-Horticultural Society of India, Calcutta,—Simla, the 7th November 1884.

SIR,—I am directed to forward the samples of fibre, referred to in the accompanying copy of a letter* received from

* No. 1183, dated the 8th October 1884, and enclosure. Mr. H. G. Turner, the Acting Collector of

Vizagapatam, and to say that this Department will be glad to be favored with a report thereon by the Fibres Committee of your Society.

From G. H. TURNER, Esq., Acting Collector of Vizagapatam, to the Secretary to the Government of India, Revenue and Agricultural Department,—

No. 1183, dated Vizagapatam, 8th October 1884.

In forwarding to you the enclosed* Proceedings of the Board of Revenue,

I have the honour to tell you, in addition * Dated 1st September 1884, No. 3047. to what appears therein, that I find that

by boiling the ribbons in a solution of carbonate of soda about 6 per cent. of the alkali, the mucilaginous substance can be so much softened that it can easily be detached by washing it in water, leaving a fibre of fairly clean aspect. Treating this fibre again with a laborious process of picking and drying, I have been able to produce a staple that will, no doubt, spin into yarn (see No. 3.)

2. It occurs to me that herein we have a nucleus of a process that may be developed by those who have time to attend to it, into the long-sought-for method for treating green Rhea stems. The *calotropis* is a more difficult plant to treat than Rhea, owing to its more gummy nature; and if the ribbons can be so readily cleaned with a little carbonate of soda and subsequent washing, nothing appears to me to remain to be done but to erect mills in a suitable locality for carrying out the subsequent process.

3. I would mention that all this process, from the steaming to the drying founded on what I know of the Favier Fremy method, with the addition that I find it is necessary to crush the stems after steaming them, and with the simple substitution of boiling in a solution of carbonate of soda to the process advocated by Mr. Fremy, which is, I believe, a secret, though, as must be known to any one who has at all studied the subject, the secret can be nothing more or less than boiling under pressure with some alkali or other. Experiments with all sorts of alkalies have been common enough from the days of Claussen downwards.

4. I should expect some difficulty to arise in washing, drying, and cleaning the extracted fibre after it has come out of the soda boilers—probably it may be found necessary to wash it in hydrochloric acid and to dry it in a centrifugal machine. These matters will, of course, at once occur to the experienced experimentalist. All I claim to draw attention to is the crude process of detaching the ribbons from the sticks by means of the steam-box and the cane-crusher, and

the softening of the mucilaginous substance by boiling the ribbons in a solution of carbonate of soda. It does not appear to me that the fibre is materially weakened by boiling it in the alkali.

5. I have also boiled the ribbons of the *calotropis* after they have been well dried in the sun, in order to see whether this process can be carried out at a distance from the field where the sticks are grown, where they would of course be decorticated, and whence the ribbons might be despatched to the boiling and cleaning factory.

I find that it only requires boiling a little longer to soften the mucilaginous substance in the dry ribbon than in the green. Hence if these experiments are

conclusive, it would seem easy to detach the ribbons in the field and forward them

† By next steamer. to wherever the factory may be. I am sending† you the following samples:—

No. 1.—The detached ribbons of the *Calotropis*.

No. 2.—The stuff when it comes out of the soda boiler.

No. 3.—The cleaned substance ready for the spinner.

I shall be much obliged by your telling me whether the samples are approved, and by your letting me know your opinion of the process I have above described.

Extract from the Proceedings of the Board of Revenue,—No. 3047, dated 1st September 1884.

READ the following:—

From H. G. TURNER, Esq., Acting Collector of Tirzagapalam, to [REDACTED] Secretary of the Board of Revenue,—No. 880, dated 15th August 1884.

I observe by the newspapers that the Government of India proposes to hold a series of experiments with fibre-extracting machines in Calcutta in September next. I have the honour to ask whether it will be possible to send a parcel of plant from this district for operating on at these experiments. I have n some interest in the fibre question from time to time, and since I returned India I have been attempting to decorticate the fibre of the *Calotropis intea* by what is known as the Favier process. This, as is probably known to the Board, consists of steaming the cut stems of the plant in a long oblong box, and after 30 minutes' steaming it is found that the ribbons of bark can be stripped off by hand with the greatest ease. The next step is to detach the fibres from the mucilaginous substance which envelopes them; and this process can, according to the authors of the invention, be carried out at home or elsewhere, provided that the ribbons are carefully dried before pressing and baling. I confess that the success of this subsequent process, known as the Fremy Urbain process, has not yet been established to my satisfaction. The process is to a certain extent a secret with which I am not acquainted, but it doubtless consists in boiling the ribbons under pressure with some alkali or other. Of course, if this subsequent process achieves the success claimed for it, the question of extracting fibre from *exogenous plants* is solved. Nothing can be cheaper, or

more simple, or better adapted to field work, or more within the scope of the farmer, whether European or Hindu, than the steaming process, for which nothing is wanted but a long box with a lid and a false bottom a couple of chatties, one inserted on the top of the other, and a tube of bamboo or tin to conduct the steam into the false bottom. Finally, a few boys can peel 100 lbs. of sticks in a short time, and this process can be facilitated by passing the cut sticks through a machine like a sugar mill. There is one point in connection with the manipulation of the bark of the *Calotropis gigantea*, and doubtless of other exogenous plants, which cannot be too strongly impressed on the cultivator as well as on the operator, and this is that it makes all the difference in the world, both as regards the process of decortication and as regards the quality of the fibre, whether we deal with young plants or with old ones, and whether they have been cultivated or are gathered wild. I have seen it stated that the *Calotropis gigantea*, for instance, does not thrive under cultivation, and that if an industry in its fibres were to spring up, it would be very soon exhausted, because the supply of wild plants would not suffice for the quantity of fibre that the market would demand, I can vouch for the fact that this is an entire delusion. I have cultivated this *Calotropis* and experimented on plants of three months' growth, and the ease of decorticating the ribbons and the length and lustre of the fibres show that the cultivated plant is in every way superior to the wild one.

2. Besides this *Calotropis*, there is a *Baemheria* and a new plant that Dr. Bidie has ~~not~~ ^{been} ~~yet~~ ^{able to} identify for me, which afford excellent samples of exogenous fibres found in the district, all of which could doubtless provide fibre of a superior class if we can only satisfy ourselves that the French Urbain process will do what is claimed for it, and I should like to send some bundles of these plants to the Calcutta experiments. I am of course familiar with the existence of the rival Death and Ellwood process, but, so far as my judgment at present, am inclined to think that, however well adapted this latter process may be for treating fibres of *endogenous* plants, it is not what we want treating the *exogens*.

RESOLUTION.—The Collector is at liberty to correspond with the person in charge of experiments in machinery for preparing fibres, and to send parcels of fibres, if they are wanted, debiting the expense to the funds at the Collector's disposal for experiments in fibres.

2. It will not have escaped Mr. Turner's notice that the fibre of the *Calotropis* (not *Calotropis*) *gigantea* has been the subject of experiments for many years past. *Vide* Drury, Wight, Royle, Ainslie, Report on Fibres, Report of Jury at Madras Exhibition, &c.

REPORT ON FIBRE SAMPLES.

I have examined these three samples *Calotropis Gigantea*, *Madar*, and I consider them to be the most unsatisfactory specimens of Fibre and half prepared fibre stuff ever submitted to me.

The No. 3, said to be "the cleaned substance ready for the spinner," is one tangled mass, in the form of what is known to the trade as "waste," to separate which by hand-picking will be costly and laborious, and when the best of the Fibre is thus selected and subjected to the hackling, or combing process, prior to passing into the spinning stage, much of it would be reduced to tow only, and consequently of small value; moreover even the best of the fibre is somewhat weakened by the free use of an alkali. I am, however, of opinion that there is sufficient indication of the presence of really good valuable fibre in the stalks, or ribbons submitted, to justify further and more carefully conducted experiments, and I would suggest that in doing so, the stalks throughout the process, or several stages thereof, should be kept straight, not reduced to an almost worthless tangled mass, and that after the steaming stage, the ribbons shown in No. 1 sample should be forwarded to Europe to be subjected to the process known as the "Fremy Urbain," and the samples valued and reported upon for future guidance as to the desirability of prosecuting the trials; and that this Society should be favoured with the result.

W. H. COGSWELL.

WITHER BLIGHT. (*Transferred to Journal.*)

CHrysanthemum CULTURE. (*Transferred to Journal.*)

Wednesday, the 31st December 1884.

W. H. COGSWELL, Esq., President, in the Chair.

THE Proceedings of the last Meeting, held on the 26th November last, were read and confirmed.

The following gentlemen, proposed at the last Meeting, were elected Ordinary Members:—

H. Miles, Esq., 28, Dalhousie Square, Calcutta.

Manager, Jatinga Valley Tea Company, Limited, Cachar.

J. Deverinne, Esq.

The names of the following gentlemen were submitted as desirous of joining the Society:—

Surgeon F. W. Wright, 33rd N. I., Buxa, Bhootan,—proposed by Baboo Pro-tapa Chundra Ghosa, seconded by Dr. S. Lynch.

Surgeon-Major J. G. Pilcher, Civil Surgeon, Howrah,—proposed by the President, seconded by W. Stalkartt, Esq.

The Hon'ble J. F. Norris, Puisne Judge,—proposed by the President, seconded by Rajah Suttyanundo Ghosal Bahadour.

A. C. Blechynden, Esq., Manager, Doomra Factory, Tirhoot,—proposed by the Deputy Secretary, seconded by John Martin, Esq.

CONTRIBUTIONS.

- Tropical Agriculturist*, for November 1884. From the Editor.
- The Sugarcane*, Vol. XVI, Nos. 84 and 85. From the Editor.
- Journal of the Asiatic Society of Bengal, Vol. LIII, Part 1, No. II, 1884. From the Society.
- Proceedings of the Agri-Horticultural Society of Madras. From the Society.
- Memoirs of the Geological Survey of India, Vol. XXI, Part I, and Ser. XIII. From Government of India.
- Records of the Geological Survey of India, Vol. XVII, Part 4, 1884. From Government of India.
- International Meteorological Observations taken simultaneously, for the month of September 1883. Prepared by the War Department, Washington, United States. From Government of India.
- Monthly Weather Review, for the month of September 1884. Prepared by the War Department, Washington, United States. From Government of India.
- Journal of the Bijnor Agricultural Institute, Vol. 2, Nos. 8 and 9. Four copies. From the Secretary.
- Report on roadside Arboriculture in the Central Provinces, for the year ending 31st March 1884. From Department of Agriculture, C. P.
- The Planters' Review*, Vol. I, Nos. 5 and 6. From the Editor.
- The Indian Forester*, Vol. X, No. 12, of December 1884. From the Editor.
- Progress Report of the Forest Administration in Ajmer, Merwara, from 1882 to 1884. From Government of India.
- A large number of Mahogany seedlings. From Dr. King, Royal Botanical Garden.
- A quantity of Munipore indigenous tea seed, grown on the Jating Valley Tea Company's Estate, Cachar, presented by W. Mackenzie Bradley, Esq.
- Five baskets of palms, orchids, &c. From Munshi Abdur Ruzzak, Port Ross Island.
- A vote of thanks was recorded for the above contributions.

COMMUNICATIONS.

From L. J. K. Brace, Esq., of the Royal Botanical Garden, Seebapore, acknowledging the receipt of a second Shaddock displaying the same peculiarity as the one previously sent and acknowledged at the last Meeting, viz., a perfect fruit formed within the larger one, both specimens were forwarded by Mr. Smith, of the City Press, and were from the same tree in Bon-Hoogly.

From F. St. C. Grimwood, Esq., c. s., North Lakhimpore, Assam, sending ten Muga Cocoons to meet an application made by the Deputy Secretary on behalf of a correspondent, who wishes to try cross-breeding with the Tusser. Mr. Grimwood reports that his own experiment in that direction has resulted in failure, owing to the Tusser worms not feeding on the leaves supplied to them.

From Messrs. Barry & Co., making certain enquiries regarding the growth and cultivation of Ceara Rubber and Ficus Elastica, to which replies had been duly furnished.

WITHER BLIGHT. (*Transferred to Journal.*)

SUGEDA INDICA (SALSOLA INDICA Willd.)

Captain Pogson writes :—

Could you, through the Secretary to the Madras Agri-Horticultural Society, secure a supply of seeds of the "Salsola Indica," Telegu name "*Ella-Kura*"?

This plant thrives in Salt marshes, and would do the same if sown on *Kullur* lands, which abound in common Salt. According to Roxburgh "it flowers during the greater part of the year. The green leaves are universally eaten by all classes of natives who live near the sea, and are reckoned very wholesome."

"The leaves of this plant alone saved many thousand lives during the famine of 1791-2-3." Roxb., Vol. II, P. 63.

If the seeds were secured experimental culture might be undertaken on salt marsh land, in and near the Calcutta Salt-Water Lake, and whilst the leaves would supply men with vegetable curry and cattle with fodder, the seed would be of great value in the Punjab and N.W. Provinces, where fertile land has been sterilized by *Kullur*, called *Reh*, in the N.W. Provinces.

The *Salt Bush* of Australia, introduced by Mr. E. C. Buck, has, I believe, answered expectation. But human beings cannot feed on its leaves, and it will take years before the Zemindars will grow it for sheep, which they neither possess, or will rear. I think however, that the S. Indica would at once be adopted, simply because it will grow on *Kullur* land and supply food to man & i fodder to cattle, and if it be true that the *Salt Bush* reclaims land sterilized by salt, it is more than probable that the "*Ella-Kura*" will do the same.

The Salt Department cannot object to the cultivation of this plant, as being grown for food and fodder, its leaves would not be burned for their ashes, and though they may be, and most likely are, somewhat salt to the taste, the percentage of salt is not sufficient to cover the cost of preparing Culinary Salt therefrom.

I venture to hope the experiment will be tried, and if some of the seed be sent me, I will get them sown on *Kullur* land in the Punjab.

JUTE AND JUTE FIBRE PREPARING MACHINES. (*Transferred to Journal.*)

CATTLE SALT. (*Transferred to Journal.*) :

MANGOE BLIGHT.

As the mangoe blossoming season is approaching, the following note which appeared in the Society's Proceeding for April 1872 is again brought forward, there having been many applications last year for a remedy for the blight which was then causing much damage. It was communicated by Mr. Scott :—

"The blight on mangoe trees referred to seems to be what is called "honey-dew." In the Gardens here I have occasionally observed it on mangoe, peach

and various other trees, it is very injurious to vegetation as under it the leaves, &c. become covered with a viscous substance which suppresses respiration. Hot and dry weather favors its development. It seems to have its origin in the attack of aphides or green flies, and the character it assumes is apparently due to exudations from the punctures in the leaves, combined with their natural excretions. The most effective and indeed the only really practicable remedy for the disease in arborescent plants, is copious syringing either with plain water, or that mixed with soft soap. It must of course be applied with a good garden engine. In cases where the disease has fairly got ahead, and not attended to till the trees are in blossom, it is of course impossible to save the crop; syringing then to cleanse the affected parts will also destroy the blossom; it should thus be practised prior to the expansion of the flower."

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RICHARD BLECHYNDEN, JUNIOR,

Deputy Secretary.

ANNUAL REPORT
OF THE
Agricultural and Horticultural Society
OF
INDIA
FOR 1884.

The Council beg to submit their Report for the year 1884.

DURING the year 66 members were elected and rejoined, a slight increase over the previous year and over 1882, the numbers in both having been the same (62), the resignations were however, slightly more, 28, against 23 in 1883; in 1882 and 1881 the resignations were 38, and 35 respectively. In June last the President prepared and issued a Special Circular to the Proprietors, Agents, Managers, &c., of Tea Gardens, Indigo, Jute, and Cotton Factories, and similar industries, pointing out the many advantages to be derived from becoming a subscriber to the Society which had done so much to benefit the country during the last 64 years, and which, with their united assistance, could do so more extensively still in the future. The result of his presentation was the acquisition of a certain number of additional members, and doubtless the repetition of such a special appeal periodically will have good effects, for as old residents retire from India, it is essential to attract the attention of those who fill their places to the good objects of the Society, as well as to the direct benefits it confers on members. The number of names removed from the list for non-payment of sub... is shows an increase of one over 1883, 26 against 25.

The number of deaths are the same as in the two previous years, 8.*

Owing to long absence from the country 20 names have been removed from the list, an increase over the previous year (11.)

The number of members on the list (576 are classified as follows:—*Life Members*, 30, *Honorary, Associate and Corresponding Members*, 21, and *Ordinary Members*, 525. Of this number 37 are absent from India, and 43 have been non-effective in 1884, thus reducing the number of effective members to 445; the same number as last year.

* Deaths.—Sir Lawrence Peel, J. S. Armstrong, Maharajah of Bettiah, Mrs. Munro, Preo Nath Sett, J. Rayson, D. Steel, and R. B. Yates.

The following is the tabulated list. Of these 107 are resident in Calcutta, 409 in other parts of India, and 60 out of India :—

CLASSIFICATION.		In 60 previous years.	In 1881.	In 1882.	In 1883.	In 1884.	Gross Total.	Total real number at the close of 1884, after deducting lapses.
Honorary Members	...	28	1	...	...	1	80	10
Associate	"	6	...	...	...	...	6	2
Corresponding "	...	15	...	1	...	1	17	9
Civilians, Covenanted and Un-covenanted	...	804	9	3	3	4	823	48
Merchants and Traders	...	701	16	8	10	4	739	83
Agriculturists	...	906	15	22	12	22	977	208
Military Officers	...	732	7	3	6	3	751	31
Medical	...	281	2	3	3	2	291	18
Asiatics	...	402	15	12	9	9	44	90
Clergy	...	42	2	...	...	1	45	7
Law Officers	...	151	1	...	1	2	155	
Miscellaneous, Police, Civil Engineers, &c.	...	260	21	10	18	17	326	64
TOTAL	...	4,828	89	62	62	66	4,607	576

The Council cannot pass over Sir Lawrence Peel's death without an expression of the great respect and esteem in which he was held by the Society, of which he was an Honorary Member since 1856, and had ever been a warm friend. A notice regarding Sir Lawrence Peel's death which appeared in the Proceedings, is reproduced in the Journal.

The usual Statements of Receipts and Disbursements is appended. It will be seen that the amount paid for seed is more than in last year by Rs. 5,250. The amount expended on the garden is less, viz., Rs. 6,482 against Rs. 9,451, though the receipts are larger, Rs. 4,365, against Rs. 3,509. There is an improvement in the General Financial Condition; at the close of the year the liabilities were Rs. 6,648, against Rs. 7,214 at

the close of 1883, and the assets were Rs. 6,331, against Rs. 5,493 in 1883. These figures do not take into account the value of the Society's house in the garden, plant houses, land, &c., which will be found in the statement attached.

Flower Show.—For a variety of reasons the Council thought it inexpedient to hold the Annual Flower Show; they, however, encouraged their Malis competing at a small Show that was held within the Calcutta International Exhibition, where they gained one or two prizes.

Garden.—The Garden Committee have more than once reported favourably on the appearance of the garden and the internal arrangements; they consider the order, condition, and good progress reflect credit on the management.

There is now a very large stock of plants in hand, including Mahogany, Mango, and other Fruit Grafts, Roses, Crotons, and other Ornamental Plants, although the distributions have been very large, 8,381 Ornamental Plants having been taken by members and 3,107 by non-members, or 11,488.

Of Fruit Grafts 2,316 have been distributed to members and 349 sold to non-members, or 2,665 grafts. In all 14,153 rooted plants, exclusive of cuttings, have been sent out from the garden, against some 12,000 last year. Seeds have also been distributed independent of the usual allowance, during the half-year 645 baskets of Vegetables, Flower, Ornamental Shrub and Trees, Economic Plants, Fodder Grass, &c., have been distributed without charge.

By kind permission of Mr. Cloete, Executive Engineer, Presidency Division, the Society has been permitted to collect seeds from the trees on the maidan. There is now an useful stock of seeds ready for distribution.

In addition to the sale of 266 baskets of flowers, applications by Hospitals and Charitable Institutions for flowers, have met with a ready response.

*Statement of Receipts and Disbursements of the AGRICULTURAL AND
HORTICULTURAL SOCIETY OF INDIA, from 1st January to 31st
December 1884.*

RECEIPTS.

From Members, Subscriptions collected during the year .....	.....	15,963	9	0
" Proceeds of country vegetable, Ceara Rubber, Renna, Potatoes, acclimated Cauliflower and sundry other seeds	1,430	8	0	
" Proceeds of surplus stock of American, English, and German vegetable, French and German flower seeds, and Melbourne field seeds, &c.	2,607	7	0	
		4,037	15	0
" Government—Proceeds of English vegetable and flower seeds, especially imported for H. M.'s Soldiers' Gardens	865	0	0	
" Proceeds of copies of Journals of the Society	30	8	0	
" Proceeds of copies of other publications	50	0	0	
" Amount of interest repaid	9	90	0	6
" Amount of suspense account in deposit for appropriation on various accounts	680	7	0	0
" Amount of packing and forwarding charges on seeds, plants, &c. ....	....	2,085	1	9
" Proceeds of produce from International Exhibition ....	....	37	9	0
" Amount of charges for Photograft of Dr. Carey's Bust, repaid .....	....	26	0	
" GARDEN—				
Proceeds of Fruit Grafts	1,058	5	0	
Proceeds of ornamental and economic plants	2,687	14	3	
		3,746	3	3
Proceeds of boxes and pots .....	....	399	11	0
Amount of cartage and packing of plants, &c., &c. ....	....	219	15	0
		4,365	13	3
Total Ordinary Receipts, Rs.	28,227	8	0
Carried over	28,227	8	0

Brought forward	28,227	8	0
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EXTRAORDINARY RECEIPTS.

From GOVERNMENT OF BENGAL—

Grant-in-aid from December 1883 to Novemb. 1884	2,400	0	0	
" Government of India Grant to meet expenses for the experimental fibre-cultivation account ...	.....	500	0	0
" H. E. the Viceroy. Annual subscription ...	.....	250	0	0
" Rent of room in use for Tea sales from December 1883 to November 1884 ...	.....	1,200	0	0
" Rent of Stable and Coach-house during the year ...	.....	190	0	0
			1,390	0	0

GRANT TESTIMONIAL FUND ACCOUNT.

From amount drawn out of Interest accrued on the invested funds to meet expenses for the International Exhibition ...

1,003	8	9
5,543	3	9

Total Receipts, Rs.	.....	83,770	11	9
Balance, gal on 1st December 18	.....	2,369	10	0
GRAND TOTAL, Rs.	.....	86,139	5	9

DISBURSEMENTS.

SEED ACCOUNT.

By Mr. Robert Bulst, Junior, for consignments of seeds received in 1883 in full, and in part for 1884 ...	.....	5,158	2	9
Messrs. Sutton & Sons for balance of consignment of seeds received in 1883 on account of the Society ...	Rs. 1,488	3	9		
And in full for seeds imported for Government during 1884 ...	..	589	0	0
			2,077	3	9
" Mr. E. Benary, for balance of consignment of seeds received in 1883	... ..	949	5	11
" Messrs. Watson and Scull for charges on Benary's seeds	... ..	116	7	8
Carried over	... ..	8,301	4	1

Brought forward	...	8,301	4	1
By Messrs. Vilmorin Andrieux & Co.				
in full for consignment of flower seeds received in 1884	...	1,066	0	2
" Messrs. Platz & Sons, in full for consignment of flower seeds received in 1884	...	568	5	5
" Mr. W. Adamson in full for consignment of field seeds received in 1884	...	683	3	4
" Mr. W. Bull in full for an assortment of flower seeds received	...	47	8	6
" Sundry parties for country vegetable, Ceara Rubber, Potatoe, acclimated Cauliflowers, &c., seeds	...	853	2	3
" Freight on consignment of American seeds received	...	121	14	9
" Col. H. R. Wintle, Futtehgarh, for <i>malis</i>	...	140	0	0
" Freight and charges in forwarding seeds imported for Government	...	14	6	
				11,793
				5 0

ESTABLISHMENT ACCOUNT.

" Office Establishment from December 1883 to November 1884, including Secretaries	...	8,932	5
agents			

LIBRARY ACCOUNT.

" Books purchased and subscriptions paid for sundry publications	24	4	0
" Duty for binding books	30	4	0
" Cost of photograph of Dr. Carey's Bust	22	0	0

76 8 0

PRINTING ACCOUNT.

" Printing Money Receipts, Annual Reports, Letters of Call, and Sundries	...	88	12	0
" Printing three sets of books for Abstract of Cash Receipts, and Members' Accounts	...	56	0	0
				144 12 0

FURNITURE ACCOUNT.

" Repairing Punkhas	...	15	8	0
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ADVERTISEMENT ACCOUNT.

" Advertising notices of Meetings	89	7	0
Carried over	21,001	13	6

Brought forward 21,001 13 6

FREIGHT ACCOUNT.

By Freight paid on packages of seeds,
plants, &c., sent 812 15 0

METCALFE HALL ACCOUNT.

„ Proportion of house-rates from October 1883 to September 1884, and Police, Lighting, and Water rates from January to December 1884 ...	540 0 0
„ Sundry petty works to the build- ing ...	3 8 0
	543 8 0

STATIONERY ACCOUNT.

„ Sundry stationery purchased 60 14 9

REFUND ACCOUNT.

„ Amount refunded, balance of *
account due to Members 84 4 0

JOURNAL ACCOUNT.

„ Printing 650 copies of Journal, Vol. VII, Part II ...	536 8
„ Lithographing and printing plates of Rice-Husking Machine	60 2 0
	596 10 0

PUBLICATION ACCOUNT.

Postage on Indian Rub
es purchased 53 2 0

EXHIBITION ACCOUNT.

of flooring and screening used ...	303 1 0
Cost of a sign-board ...	42 7 0
Making and repairing models and materials purchased for working in them ...	269 2 9
Wages of workmen, conveyance of plants, and sundry petty ex- penses ...	592 9 3
	1,206 4 0

PETTY CHARGES ACCOUNT.

Postage on letters, circulars, Journal, &c., &c., and receipt stamps ...	199 3 6
Punkhawallas, carriage, boat and cooly-hire, landing and forward- ing charges, cost of wax cloth, oil cloth, twine, analysing earth, &c., &c., &c. ...	519 0 9
	718 4 3
	25,027 11 6
Carried over ...	25,027 11 6

Brought forward	25,027	1 <i>l.</i>	6
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GARDEN ACCOUNT.

By Cost of sundry materials for propagation of Roses, Fruit grafts, Orchids, &c., including cost of plant-house, sheds, &c., &c., ..	174	2	9			
" Cost of tools, implements, cartage, &c., of plants, and contingencies, including masonry repairs	733	8	0			
" Assessment on Garden house and the Garden	132	0	0			
" Cost of boxes and pots purchased	613	11	6			
				1,653	6	3
" Wages of Native Establishment from December 1883 to November 1884				4,394	2	9
" Allowance to Deputy Secretary for superintending the Garden				1,200	0	0

PLANT ACCOUNT.

" Sundry articles for fruit, seedlings, ornamental plants, &c., including charge for freight, &c., on plants from different places	434	13	0			
				7,682	6	0
Total Expenses						
" Balance in hand of Bank of Bengal at 1st December 1884				2,980	4	
" Balance in hand of Deputy Secretary to meet expenses on Fibre Experimental Cultivation Account				500	0	0
				3,430	4	8
GRAND TOTAL, Rs.					86,140	5 9

